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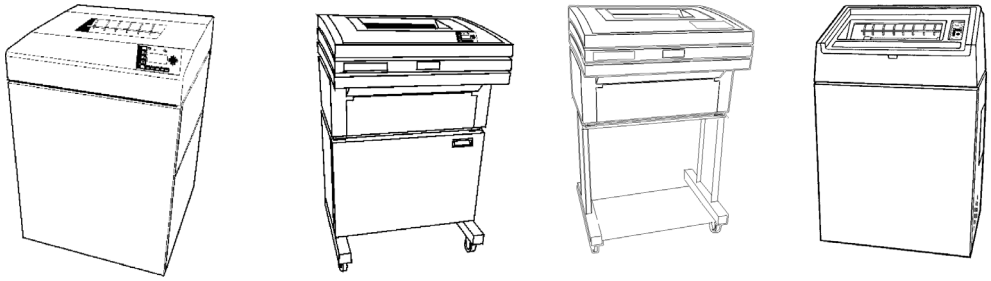

5000 Series
Programmer's Manual
GEK – 00031B

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CHAPTER 1. INTRODUCTION

OVERVIEW OF PRINTER EMULATION

Commands are sent to the printer in the form of control codes and escape sequences. These differ from normal data to be printed in that they give instructions to the printer on paper movement, style of print, size, density, and many other selectable features.

Certain protocols are needed so that the printer can recognize and act on these commands sent from the host.

The shuttle matrix printer contains emulations to make it behave in a manner that is functionally similar to other printers. The emulations that it contains are:

- ANSI Standard X3.64-1979 (Default)
- Printronix P300/P600
- Printronix P Series
- IBM Proprinter
- Epson FX286-e (9-wire dot matrix)
- DEC LG / Compaq LGPlus
- DEC PPL III

Each emulation has a set of control codes and/or escape sequences that are explained in this manual. There is a separate chapter for each emulation.

CONTROL CODES

Control codes are used to transmit information other than printable characters to the printer. They may occupy the first 32 locations on the ASCII code chart and are represented by two- or three-letter abbreviations. Locations 0X80 through 0X9F may also be interpreted as control codes, depending on the emulation and settings.

The control code <LF> (10 decimal, 0A hex), for instance, is almost universally interpreted as a line feed. However, the response of the printer to other control codes will depend on the emulation.

ESCAPE SEQUENCES

Remote selection of the printer's functions and features is achieved by using command strings (a combination of characters and parameters) preceded by an <ESC> (27 decimal, IB hex) or CSI character (155 decimal, 9B hex). Escape sequences associated with similar functions will vary from one emulation to the next.

NOTE

The physical spaces in the escape sequences shown in this publication are only for clarification purposes and are not used in the actual string. If a space is actually needed in the sequence, it will be shown as an <SP> in the mnemonic form of the sequence. In the decimal form, it will appear as a 32, and in the hexadecimal form, as 20.

Examples are shown below of escape sequences as written in the text: with parameters filled in and written in the BASIC programming language assuming the use of the LPRINT instruction. The parameter values are actualized in these examples, but will be shown as parameters thereafter. Note that parameters are surrounded by angle brackets (<>).

Tab Clear

Mnemonic:	<ESC> [<p1> g	(assume p1=16)
Decimal:	27 91 16 103	
Hex:	1B 5B 10 67	
BASIC:	CHR$(27);"[16g"	

Horizontal Tabs Set

Mnemonic:	<ESC> [<p1> ; <p2>... u	(assume p1=648, p2=1386, p3=2808)
Decimal:	27 91 648 59 1386 59 2808 117	
Hex:	1B 5B 288 3B 56A 3B 0AF8 75	
BASIC:	CHR$(27);"[648;1386;2808u"	

Expand Characters

Mnemonic:	<ESC> [<p1> ; <p2> SP B	(assume p1=200 and p2=200)
Decimal:	27 91 200 59 200 32 66	
Hex:	1B 5B C8 3B C8 20 42	
BASIC:	CHR$(27);"[200;200 B"	

CSI AND OSC

A control sequence introducer <CSI> signals the beginning of an ANSI sequence using the <ESC> code and the left bracket ([). <CSI> (9B hex) can be used instead of <ESC> [(1B 5B hex) when the printer is receiving and processing 8-bit data. <ESC> [will be used predominately in this manual for the examples.

An operating system command (OSC) signals the start of a download sequence using the <ESC> code and the right bracket (]). <OSC> (9D hex) can be use instead of <ESC>] (1B 5D hex) when the printer is receiving and processing 8 bit data. <ESC>] will be used predominately in this manual for the examples.

LINE TERMINATORS

Some control codes and escape sequences act as line terminators. Line terminators cause all data received since the last terminator to be printed. Without a terminator, data will remain buffered.

DECIPOINTS

Throughout this manual decipoints are used as a unit of measure. A decipoint equals 1/720th of an inch and is used as a standard of measurement for parameters associated with set distances. A few examples are margins, tabs, and vertical paper movements. See Appendix D for the decipoint conversion tables.

SCS SMART GRAPHICS CAPABILITIES

The 5000 series printers have SCS smart graphics processing as a standard feature that can be enabled via the CCU control panel menus. The graphics emulations include both IGP and QMS Code V version 2. There are separate programming manuals for each of these graphics language emulations.

The graphics printing emulations provide capabilities for such things as:

- Barcoding (including POSTNET codes)
- Rotated text
- Downloading of and host-controlled selection of predefined forms
- Loading of data into predefined forms
- Dynamic alphanumeric data

CHAPTER 2. ANSI EMULATION

CONTROL CODE AND ESCAPE SEQUENCE ACTIVITY LEVELS

ANSI control codes and escape sequences are assigned activity levels depending on which print mode is currently active. The following charts provide information on what to expect from the control codes and escape sequences in each printing mode.

I-IGNORED	No noticeable effect on printing will occur.
V-VALID	These sequences do not affect the printing mode in progress, but take effect when normal printing resumes.
A–ACTIVE	This sequence takes effect immediately.
D–DATA	These control codes are used as data.

Notes

Note 1	When printer option 1 is active, either in ANSI (4800) or ANSI (4410) emulation, <SO> and <SI> activate or deactivate this printing mode. <SO> and <SI> are VALID in bar codes and oversize print mode. They are ACTIVE in expanded print mode. Please see Appendix D, Description of Strapping options, ANSI (4800) or ANSI (4410) tables on page 271 for details on options which affect printer operation in ANSI emulation.
Note 2	VALID during enhanced oversize, ACTIVE during normal oversize.
Note 3	Discarded while in the native mode.
Note 4	Causes an error symbol to print (XOX).

Control Code Activity Levels

Control Code Activity Levels						
Control Code	**Line Terminator**	**Normal**	**Dot Graphics**	**Bar Codes**	**Oversize**	**POSTNET**
BEL	No	A	A	D	A	Note 4
BS	Yes	A	I	I	I	Note 4
CR	Yes	A	A	I	A	Note 4
DC1	No	A	A	D	A	Note 4
DC3	No	A	A	D	A	Note 4
DEL	No	Note 3	Note 3	D	Note 3	Note 4
FF	Yes	A	A	I	A	Note 4
HT	No	A	A	A	A	A
LF	Yes	A	A	I	A	Note 4
SI	No	A	I	Note 1	Note 1	Note 4
SO	No	A	I	Note 1	Note 1	Note 4
VT	Yes	A	A	I	A	Note 4

Escape Sequence Activity Levels

Escape Sequence	Line Terminator	Normal	Dot Graphics	Bar Codes	Oversize	POSTNET
DCS (Graphics)	No	A	I	I	A	I
Font Load	No	A	I	I	A	I
GENBCS	No	A	A	A	A	I
GENFD	No	A	A	A	A	I
GENGRM	No	A	V	A	A	I
GENHTS	No	A	A	A	A	I
GENOSM	No	A	V	V	A	I
GENSLR	No	A	A	A	A	I
GENSNC	No	A	V	V	Note 2	I
GENSPM	No	A	V	A	A	A
GENTST	Yes	A	A	I	A	I
GENVFU	Yes	A	A	A	A	I
DENVTS	No	A	A	A	A	I
GSM	No	A	V	V	A	I
HPA	Yes	A	A	A	A	I
HPB	Yes	A	A	A	A	I
HPR	No	A	A	A	A	I
HTS	No	A	A	A	A	I
HVP	Yes	A	A	A	A	I
PLD	Yes	A	I	I	A	I
PLU	Yes	A	I	I	A	I
REP	No	A	A	I	A	I
RIS	No	A	A	A	A	I
RM	No	A	A	A	A	I
SGR	No	A	V	V	Note 2	I
SM	No	A	A	A	A	I
SPI	No	A	V	V	Note 2	I
ST	No	I	A	I	I	I
TBC	No	A	A	A	A	I
VFU Load	No	A	I	I	A	I
VPA	Yes	A	A	A	A	I
VPB	Yes	A	A	A	A	I
VPR	Yes	A	A	A	A	I
VTS	No	A	A	A	A	I

CONTROL CODE DEFINITIONS

BEL — **Bell (07H):** Receipt of a BEL code causes the beeper to sound for approximately 1/2 second after any preceding printable data has been processed.

BS — **Back Space (08H):** Line terminator. The paper position remains unchanged and the print position is moved left one character space from the current. If the print position is at the left margin, no action is taken.

CR — **Carriage Return (0DH):** Line terminator. The print position is reset to the left margin, and the paper position is left unchanged.

CSI — **Control Sequence Introducer (9BH):** Signals the beginning of an ANSI control sequence. When 8-bit data is used, CSI (9BH) can be substituted for ESC [(1BH 5BH). Also see ESC.

DC1 — **Device Control 1 (11H):** Parallel and Serial Interface: Receipt of a DC1 code with the printer in local mode puts the printer online (selects printer) and enables receipt of data.

Through CCU menu options, a serial interface protocol may be selected that transmits a DC1 code to the host to signal that the printer is ready to receive data.

NOTE
The print position can also be set to the left margin via the CCU Control Panel Menu using the SETUP/FORMAT/MODIFY FORMAT/PRINT CONTROL menu selection.

DC3 — **Device Control 3 (13H):** Parallel and Serial Interface: Receipt of a DC3 code when online places the printer in local mode (deselects printer) and causes it to ignore all data except a <DC1>.

Through menu options, a serial interface protocol may be selected that transmits a <DC3> code to the host to signal that the printer is not ready to receive data.

(See note for <DC1), above.)

ESC — **Escape (1BH):** Signals the beginning of an escape sequence. See also CSI above.

FF **Form Feed (0CH):** Line terminator. The paper is advanced to the next top-of-form position. When the EVFU is enabled and programmed, paper will advance to the next stop in channel 1.

NOTE
An option strap from the CCU Control Panel Menu using the SETUP/FORMAT/MODIFY FORMAT/GENPRTOPTS selection can disable this feature.

HT **Horizontal Tab (09H):** Advances the print position to the next horizontal tab location. If no tabs are set, an HT code is either converted to a space or ignored, depending on the menu option settings.

LF **Line Feed (0AH):** Line terminator. The paper is advanced to the next line. When printing horizontal dot graphics, the paper is advanced to the next dot row.

(See note for <FF>, above.)

SI **Shift In (0FH):** Used to exit a Special Print Mode (GENSPM) when ANSI emulation strap 1 (Appendix G, tables 5 and 6) is active.

SO **Shift Out (0EH):** Used to enable a special print mode (GENSPM) when ANSI emulation strap (Appendix G, tables 5 and 6) 1 is inactive.

VT **Vertical Tab (0BH):** Line terminator. The paper is advanced to the next vertical tab stop. If no tabs are set, a VT code causes a line feed. When using the EVFU, paper advances to the next stop in channel 12.

(See note for <FF>, above.)

ESCAPE SEQUENCE DIRECTORY

Sequence	Meaning	Page
CSI or ESC [	Control Sequence Introducer	19
CSI p1 p2 SP ~	GENEMU: Selects emulation	21
ESC [p1 ; p2 SP B	GSM: Modifies vertical (p1) and horizontal (p2) character size	31
ESC [p1 ; p2 SP G	SPI: Sets lpi (p1) and/or cpi (p2) in decipoints	32
ESC H	HTS: Sets a tab at current print position	30
ESC J	VTS: Sets a tab at current paper position	28
ESC K	PLD: Moves print line down 3/72 inch (subscript)	25
ESC L	PLU: Moves print line up 3/72 inch (superscript)	42
ESC P	DCS: Introduces dot graphics	40
ESC Q	Self-Test: Inactive. Sequence ignored.	
ESC [p1 a	HPR: Moves print position right p1 distance (relative)	25
ESC [p1 b	REP: Dot graphics: repeat preceding character p1 times	40
ESC c	RIS: Resets printer to a known initial state	35
ESC [p1 d	VPA: Sets vertical position to p1 decipoints or lines	26
ESC [pl e	VPR: Moves paper forward p1 decipoints	26
ESC [p1; p2 f	HVP: Moves paper and print position (absolute)	26
ESC [p1 g	TBC: Clears tabs: p1=3 for horizontal	28
ESC [p1 ; ...; pn h	SM: Set mode (PUM, LNM, proportional, character mapping)	34
ESC [p1 j	HPB: Moves print position left by decipoints or columns	26
ESC [p1 k	VPB: Moves paper backward by decipoints or lines	27
ESC [p1 l	RM: Reset mode (PUM, LNM, proportional, character mapping)	32
ESC [p1; ... pn m	SGR: Selects font styles and enhancements	32
ESC [p1 p2 ! p	GENVF2: EVFU vertical paper movement command	44
ESC [p1 ; p2 ; p3 q	GENGRM: Selects graphics horizontal and vertical dot densities	41
ESC [p1; p2 ; p3 r	GENFD: Sets form length (pl), margins: top (p2), bottom (p3)	28
ESC [p1; p2 s	GENSLR: Sets margins: left (p1), right (p2) in decipoints	29
ESC [p1 t	Selects bar codes p1=3, quit bar code p1=0	46

Sequence	Meaning	Page
ESC [p1;... pn u	GENHTS: Sets horizontal tabs (p1, etc.) in decipoints or columns	30
ESC [p1 ;... p12;v	GENVTS: Sets vertical tabs (p1, etc.) in decipoints or lines	30
ESC [p1 x	GENSNC: Selects international character sets	22
ESC [p1 ; ...;p10 }	Selects bar code parameters	
ESC [p1 SP }	GENDFC: Download Font Control: Checks printer for downloaded font	35
OSC or ESC]	Operating System Command: introduces sequence	19
ESC] 5	BFL (Begin Font Load): Valid only if download option is installed.	35
ESC] !	Begins 12-channel EVFU table loading	42
ESC \	ST: String Terminator. Exits special modes	19
ESC [p1 `	HPA: Horizontal Position Absolute	27
OSC 9 ; p1 ; ... ; p8-pn ST	Character Map Load	23

ANSI ESCAPE SEQUENCE CATEGORIES

The ANSI escape sequences have been separated according to functionality. Special areas of interest, such as graphics and the electronic vertical format unit (EVFU), have been described in separate sections. The functional groups are:

- Housekeeping
- Paper and Print Positioning
- Margins and Tabs
- Font Handling and Enhancements
- Graphics
- EVFU

Housekeeping Sequences

ESC [**CSI (Control Sequence Introducer):** This sequence is used to begin sequences, that generally have multiple parameters.

ESC] **OSC (Operating System Command):** This is another special sequence introducer. Sequences which begin with OSC require the ST string terminator sequence (ESC \) to end them.

ESC ** **ST (String Terminator): Terminates the loading of EVFU tables, download fonts, and dot graphics strings.

ESC c **RIS (Reset to Initial State):** Resets the printer to either the standard state shown below or to the state stored in the customer save area of memory. The RIS sequence can be disabled by ANSI option strap 3 (see Appendix D, ANSI (4800) or ANSI (4410), option 3).

RIS – Reset to Initial State	
Parameter	**State**
Font Style	Gothic Draft
Character Size	1X Vertical, 1X Horizontal
Character Pitch	10 cpi
Country Selection	USA
Code Page	437
Line Spacing	6 lpi
Partial Line Up	Reset
Partial Line Down	Reset
Bold Print	Inactive
Underline Mode	Inactive
Expanded Mode	Inactive
Proportional Mode	Reset
Horizontal Tab Table	Empty
Left Margin	None - Column 0
Right Margin	None - Maximum
Form Number	7
Page Size	7920 decipoints/ 66 lines/11 inches
Top Margin	None
Bottom Margin	None
Forms Position	Top of form - current position
Vertical Tab Table	Empty
Vertical Format Unit	Default
Graphics Density	60 H dpi, 72 V dpi, horizontal format
VFU Load In Progress	Exit (nothing saved)
Bar Code Mode	Inactive
Dot Graphics	Inactive

Decimal 27 99:
Hex: 1B 63
BASIC: CHR$(27);"c";

ESC Q **GENTST (Self-Test):** This sequence is ignored.

Decimal: 27 102 or 120
Hex: 1B 5C or 9C
BASIC: CHR$(27);"Q";

CSI p1 p2 SP ~ **GENEMU (Emulation Control):** Switches the control of the printer to another emulation. The parameters in the sequence are defined as follows:

p1 Emulation identifier. This parameter selects the particular emulation by a reference number supplied by GENICOM engineering. The assigned numbers may be found in the table below.

p2 Reset control. Permits the parameters of the printer to be reset or defaulted. It is not always possible to meet the strict definition of this parameter, so each printer has a definition of how the reset control is implemented. The values as currently defined are:

0 Hold values (default). All possible values for printer control, e.g., tabs, margins, page length, are to be retained.

1 Full reset. Resets parameters to initial state.

p1	Manufacturer	Emulation
0	GENICOM	ANSI
10	GENICOM	4410 ANSI
1-19	GENICOM	Reserved
20	IBM	Graphics Printer
21	IBM	Proprinter XL 9-wire
22	Epson	FX286-e
23	IBM	Proprinter XL 24-wire
24	Epson	LQ2500
30	Data Products	ANSI
40	Printronix	P300
41	Printronix	P5008

Indeterminate Conditions

If no emulation parameter is supplied, the emulation remains in the current state and the rest of the sequence is ignored. Other parameter values and other parameters are reserved.

Mnemonic: <CSI> <p1> <p2> <SP> ~
Decimal: 27 91 <p1> <p2> 32 126
Hex: 1B 5B <p1> <p2> 20 7E
BASIC: CHR$(27);"<p1><p2><SP>~";

Character Set Selection

ESC [p1 x

GENSNC (Select National Characters): This sequence selects the national character substitution if the currently selected character style supports it. The following values may be used for p1.

p1	Country Map or Character Set
0	USA (ISO)
1	German (ISO)
2	French A (ISO)
3	French B
4	French Canadian
5	Dutch (Netherlands)
6	Italian
7	United Kingdom (ISO)
8	Spanish
9	Danish/Norwegian A
10	Danish/Norwegian B
11	Danish/Norwegian C
12	Danish/Norwegian D
13	Swedish/Finnish A
14	Swedish/Finnish B
15	Swedish/Finnish C
16	Swedish/Finnish D
17	Swiss
18	(Ignored)
19	Yugoslavian
20	United Kingdom A
21	Turkish
22	Greek
23	Italian (ISO)
24	Spanish (ISO)
437	IBM PC USA (MS Code Page 437)
850	IBM PC Multilingual (MS Code Page 850)
852	Microsoft Code Page 852 (East Europe)
853	Microsoft Code Page 853 (Turkey)
855	Microsoft Code Page 855 (Cyrillic)
860	Microsoft Code Page 860
863	Microsoft Code Page 863 (French Canadian)
864	Microsoft Code Page 864
865	Microsoft Code Page 865
866	Microsoft Code Page 866 (Russian)
867	Microsoft Code Page 867
8572	USSR GOST (Russian)
8573	Greek Code Page 437
8574	DEC Multinational (LA-210)
8575	Roman 8
8576	Polish Mazowia
8577	Turkish 8-bit Code Page
8578	Greek Code Page 851
8591	ISO 8859-1 Latin Alphabet #1
8592	ISO 8859-2 Latin Alphabet #2

p1	Country Map or Character Set
8593	ISO 8859-3 Latin Alphabet #3
8594	ISO 8859-4 Latin Alphabet #4
8595	ISO 8859-5 Latin/Cyrillic
8596	ISO 8859-6 Latin/Arabic
8597	ISO 8859-7 Latin/Greek
8598	ISO 8859-8 Latin/Hebrew
8599	ISO 8859-9 Latin Alphabet #5

Character Map Load

OSC 9 ; p1 ; ... ; p8-pn ST

Character Map Load: This sequence signals the beginning of a Character Map Load data transfer. Character map definitions, which follow this sequence, are stored in non-volatile memory. The character map is selected with the GENICOM Select National Characters (GENSNC) command using the p2 parameter that is specified in the load sequence for this command. The load is terminated by a String Terminator (ST) sequence. The downloaded character map replaces the USA ISO character set in character map memory.

A single character map containing 128 substitutions may be specified. A character map may be designated for either the GL table (codes 20H-7EH) or the GR table (codes 80H-FFH). Any substitutions not specified within a character map load will be mapped one-to-one. For example, code 41H prints the character normally found at location 41H (upper case A). When a character map designated as a GR map is selected by the GENSNC command (see Character Set Selection on page 22), the GL map will automatically be mapped one-to-one. A standard GL (7-bit) character map, such as French A, may be specified as the base for a downloaded GR (8-bit) character map, but an 8-bit GR map, Code Page 866, for example, may NOT be used as the base for a GL character map.

The complete syntax for the Character Set Load is shown below:

<OSC>9;<p1>;<p2>;...;<pn><ST>

p1 Control Command
- 0 Stores new character map
- 1 Erases existing character. In this case, parameters p2-pn are ignored and need not be supplied. An existing downloaded character map need not be erased before a new character map is loaded.

All other values of p1 are reserved.

p2 GENSNC (CSI p1 x) select parameter. Values must be between 90 and 99 in order not to interfere with GENICOM standard character maps. If a downloaded character map select parameter is a value other than 90 through 99, the download character map command is ignored.

p3 Reserved. This parameter is marked by inserting a semicolon (;) in the command sequence.

p4 Reserved. This parameter is marked by inserting a semicolon (;) in the command sequence.

p5 Reserved. This parameter is marked by inserting a semicolon (;) in the command sequence.

p6 A literal string indicating the GENSNC select parameter of an existing character map (such as 437 or 850) to be used as a base in which substitutions from this command sequence may be made. This string may be up to 10 characters in length and must be specified only if the downloaded character map uses an existing map as a base. The string is terminated by a semi-colon (;). The base character map always defaults to Code Page 437 if an ACT character map is specified and the downloaded character map is a GR table. If the downloaded map is a GL table, p6 must specify an existing GL table as the base or a one-to-one default base is used.

p7 A literal string used to identify the character map in the Progam Mode Font – Country menu. This string may be up to 20 characters in length and is terminated by a semi-colon (;). Note that only the first 11 characters of this string are used for display purposes.

p8-pn A trio of parameters used to specify the actual character map substitution. A semicolon must separate each parameter within the trio, and a semicolon must terminate each trio. The semicolon is not required for the last trio that immediately precedes the String Terminator (ESC \).

The elements of each trio are defined as follows:

1 A decimal number that identifies the destination character. This is the character value received from the host. For example, an upper case "A" has a decimal value of 65. Values of 32 through 126 and 128 through 255 are valid for this element.

The first element processed in the first substitution trio defines whether the map is for GL (7-bit) or GR (8-bit) substitution. If the first element is between 32 and 126 (inclusive), the map is GL, and the first element of each trio must also be between 32 and 126. Likewise, if the first element of the first trio is between 128 and 255, the map is a GR map and all first elements must fall between 128 and 255. The character substitution map is discarded if this rule is violated.

2 A decimal number that identifies the source character. This is the location value of the desired character pattern in the printer font set. For example, an upper case "A" has a decimal value of 65. Values of 0 through the last available character for the currently selected font are valid for this element.

3 Reserved. A semicolon (;) is required to mark this element position. A zero is permitted.

Paper and Print Position Movements

ESC K

PLD (Partial Line Down): Line terminator. Moves the print line down 3/72 inch for subscript printing. Also returns to the original line following a partial line up (<ESC> L - superscript) sequence. See note below.

Decimal: 27 75
Hex: 1B 4B
BASIC: CHR(27)$;"K";

ESC L

PLU (Partial Line Up): Line terminator. Moves the print line up 3/72 inch for superscript printing. Also used to return to the original line following a partial line down (ESC K - subscript) sequence. See note.

Decimal: 27 76
Hex: 1B 4C
BASIC: CHR$(27);"L";

NOTE

In the 4800 emulation, these sequences can be used in succession to advance or reverse the paper to another line. In the 4410 emulation, they can be used in pairs to change from superscript directly to subscript or subscript directly to superscript, but can not be used to position the paper.

Also see the SScript: ON/OFF menu selection in the User's Manual.

ESC [p1 a

HPR (Horizontal Position Relative): Line terminator. Moves the print position to the right of the current position. The distance specified by the p1 parameter is in decipoints. An HPR move exceeding the right margin sets the print position at the margin. If the p1 parameter is zero or missing, the command is ignored.

Decimal: 27 91 <p1> 97
Hex: 1B 5B <p1> 61
BASIC: CHR$(27);"[<p1>a";

ESC [p1 d

VPA (Vertical Position Absolute): Line terminator. Sets the vertical position to the value specified by <p1>, moving paper forward or backward to the new position. The distance specified by the <p1> parameter is in decipoints. This command can be used to print inside top and bottom margins. If the specified position is not within the current page, the command is ignored. If the parameter value is omitted or less than 5 decipoints, it will result in the vertical position being set to the top of form position.

Decimal: 27 91 <p1> 100
Hex: 1B 5B <p1> 64
BASIC: CHR$(27);"[";CHR$(<p1>);"d";

ESC [p1 e

VPR (Vertical Position Relative): Line terminator. Increases the current vertical position by the value specified by p1. Decipoints are converted to provide the 1/144-inch moves shown in the table.

Decipoint Value	Movement In Inches
Missing or 0 – 4	No Movement
5-9	1/144 inch
10-14	2/144 inch
15-19	3/144 inch
17,280 or greater	24 inches

Decimal: 27 91 <p1> 95
Hex: 1B 5B <pl> 65
BASIC: CHR$(27);"[<p1>e";

ESC [p1 ; p2 f

HVP (Horizontal and Vertical Position): Line terminator. Sets the vertical paper position to the value of <p1> and the print position to the <p2> value. Values are sent as decipoints. HVP can position printing inside margins. The vertical position can not exceed the form length and the horizontal position cannot exceed the maximum width for the printer.

Decimal: 27 91 <p1> 52 96
Hex: 1B 5B <p1> 3B <p2> 66
BASIC: CHR$(27);"[<p1>;<p2>;f";

ESC [p1 j

HPB (Horizontal Position Backward): Line terminator. Moves the print position left of the current position by the distance specified in <p1>. Values are sent as decipoints. The print position is set to the left margin if the <p1> value would exceed the margin. An HPB with a <p1> value of zero is ignored.

Decimal: 27 91 <p1> 106
Hex: 1B 5B <p1> 6A
BASIC: CHR$(27);"[<p1>j";

ESC [p1 k **VPB (Vertical Position Backwards):** Line terminator. Moves the paper in reverse by the distance specified by p1. Values can be sent as decipoints. The paper position is set to the top margin if the p1 value exceeds the margin. A VPB with a p1 value of 5 decipoints or less is ignored.

Decimal: 27 91 <p1> 107
Hex: 1B 5B <p1> 6B
BASIC: CHR$(27);"[<p1>k";

ESC [p1 ' **HPA (Horizontal Position Absolute):** Line terminator. Moves the print position to the value specified in <p1>. Values are sent as decipoints. Position zero is column one. The print position is set to the right margin if the <p1> value would exceed the margin. An HPB with a <p1> value greater than 9792 is ignored.

Decimal: 27 91 <p1> 96
Hex: 1B 5B <p1> 60
BASIC: CHR$(27);"[<p1>'";

Margins and Tabs

ESC H **HTS (Horizontal Tab Set):** Sets a tab at the current print position and updates any existing horizontal tab table. A total of 22 tabs can be set. If this number is exceeded, the leftmost 22 tabs will be retained.

Decimal: 27 72
Hex: 1B 48
BASIC: CHR$(27);"H";

ESC J **VTS (Vertical Tab Set):** Sets a tab at the current print position and updates any existing vertical tab table. A total of 12 tabs can be set. If this number is exceeded, the 12 tabs closest to the top of the page will be retained.

Decimal: 27 74
Hex: 1B 4A
BASIC: CHR$(27);"J";

ESC [p1 g **TBC (Tab Clear):** Clears horizontal or vertical tab stops based on the p1 value as follows:

p1 = 0 Clears horizontal tab at current print position.
p1 = 1 Clears vertical tab at current print position.
p1 = 3 Clears all horizontal tabs.
p1 = 4 Clears all vertical tabs.

More than one parameter can be used.

Example: To clear all horizontal and vertical tabs, send:

<ESC> [3 ; 4 g

Decimal: 27 91 <p1> 103
Hex: 1B 5B <p1> 67
BASIC: CHR$(27);"[<p1>;"g";

ESC [p1; p2 ; p3 r **GENFD (Forms Definition):** Establishes the form length <p1>, the top margin <p2>, and the bottom margin <p3> in decipoints. Default parameters are for an 11-inch (7,920 decipoints) long form with a top and bottom margin of zero.

p1 - maximum allowable length is 24 inches (17,280 decipoints).
p2 - top of page to first print line
p3 – non-printable area at bottom of form

Decimal: 27 91 <p1> <p2> <p3> r
Hex: 1B 5B <p1> <p2> <p3>
BASIC: CHR$(27);"[<p1>;<p2>;<p3>r";

Sequence	Explanation
ESC [r	Default values of 11-inch form length, zero top and bottom margins.
ESC [8280 r	11.5-inch form length, default top and bottom margins of zero
ESC [; 720 r	Default length of 11 inches, top margin of 1-inch. Default bottom margin of zero.
ESC [; ; 720 r	Default length of 11 inches, default top margin of zero, and a 1-inch bottom margin.
ESC [7920 ; 360 ; 360 r	11-inch form length, ½-inch top and bottom margins

Decimal: 27 91 <p1> <p2> <p3> 114
Hex: 1B 5B <p1> <p2> <p3> 72
BASIC: CHR$(27);"[<p1><p2><p3>r";

ESC [p1; p2 s

GENSLR (Set Left/Right Margins): The p parameters are distances from the left edge of the printable area of the paper. Parameter <p1> sets the left margin and <p2> sets the right margin. An omitted parameter clears that margin. Invalid parameters set the left margin to zero (column 1) and the right margin to 9,504 decipoints (column 136 at 10 cpi for the 13.6-inch machines).

A new left margin takes effect following any line terminator that normally calls for a print position set to the left. A new right margin takes effect when the print position reaches the new margin.

Margin settings stored as decipoint values are enforced to the nearest 1/120 of an inch. Character printing operates at 1/120 of an inch.

Decimal: 27 91 <p1> <p2> 115
Hex: 1B 5B <p1> <p2> 73
BASIC: CHR$(27);"[<p1><p2>s";

NOTE

There is a physical left margin of .6 to 1.6 inches from the edge of the paper to the first printable column. This distance is adjustable by sliding all four tractors sideways. The margins set with this sequence begin at the first physical print position, not at the edge of the paper.

ESC [p1 ; ... p22; u **GENHTS (Multiple Horizontal Tab Set):** Sets up to 22 horizontal tabs. The p parameters are set in decipoints.

If more than 22 tabs are set, the highest numbered tabs (farthest right) will be pushed out of the tab table. Tabs set in front of the left margin, or beyond the right margin. are not usable. Moving the margins will make them active.

Example: To place tabs at columns 10, 20, and 40 at 10 cpi, send ESC [10 ; 40 ; 20 u (tabs can be specified in any order).

Decimal: 27 91 <p1> 59 <p2> 59 ... <p22> 59 117
Hex: 1B 5B <p1> 3B <p2> 3B ... 3B <p22> 3B 75
BASIC: CHR$(27);"[<p1>;<p2>; ... ;<p22>;u"

ESC [p1 ; ...; p12 ; v **GENVTS (Multiple Vertical Tab Set):** Sets up to 12 vertical tabs. The p parameters are set in decipoints. If more than 12 tabs are set, the 12 tabs nearest the top of form will be retained. If a tab is set in the top margin area, it will be stored but will not be active until the margin is moved. If a tab is set beyond the bottom margin, attempting to move to that tab will advance the paper to the next top of form.

Decimal: 27 91 <p1> 59 <p2> 59 ... <p12> 59 118
Hex: 1B 5B <p1> 3B <p2> 3B ... <p12> 3B 76
BASIC: CHR$(27);"[<p1>;<p2>;...;<p12>;v";

Font Handling and Enhancements

ESC [p1; p2 SP B **GSM (Graphic Size Modification):** This sequence modifies the vertical <p1> and horizontal <p2> size of expanded and oversize characters. When using expanded characters, the currently selected font style is used. Oversize uses its own distinct font style.

Parameter values are percentages of the normal size character, so values over 100 are needed for expansion. Expansion factors are obtained by dividing values by 100.

Example: A parameter value of 526 would be divided by 100 to produce an expansion factor of 5 (5X expansion). Values less than 100 are treated as 1X expansion.

X1: 0-199 (Default)	**X4:** 400-499	**X7:** 700-799
X2: 200-299	**X5:** 500-599	**X8:** 800-UP
X3: 300-399	**X6:** 600-699	

Mixed sizes within a line can be top or bottom justified depending on the Program Mode menu option (see VExOpt:Default and VExOpt: Baseline).

The top of an expanded character is used as the starting point for vertical paper movement (line feed). The top or bottom of oversize characters can be used depending on the state of menu option SETUP | FORMAT | MODIFY FORMAT |GENPRTOPTS | GROUP 2 |Strap 13.

When this sequence is received with a value of 200 or more, expanded printing starts if the printer is in the text mode (not bar codes, oversize, etc.

Examples:

ESC [; 200 B	X1 Vertical	X2 Horizontal
ESC [200 ; 200 B	X2 Vertical	X2 Horizontal
ESC [800 ; 400 B	X8 Vertical	X4 Horizontal

During vertically expanded printing, blank lines (lines with no printed characters) are not expanded from the current lpi setting.

Decimal: 27 91 p1 59 p2 32 66
Hex: 1B 5B p1 3B p2 20 42
BASIC: CHR$(27);"[<p1>;<p2>B";

ESC [p1 ; p2 SP G **SPI (Spacing Increment):** This sequence is used to set line spacing (p1) and character spacing or pitch (p2). If the parameter is missing or zero, the spacing remains unchanged. In the native mode, p1 can range from 1 to 17,820 decipoints (24 inches). The printable area (between the top and bottom margin) can not be exceeded. The range of p2 is dependent on the font and will be ignored if exceeded.

Examples of Spacing Values

LPI Spacing	
LPI	**p1 (decipoints)**
3	240
4	180
6	120
8	90

CPI Spacing	
CPI	**p2 (decipoints)**
10	72
12	60
13.3	54
15	42
16.7	36

Decimal: 27 91 p1 59 p2 32 71
Hex: 1B 5B p1 3B p2 20 47
BASIC: CHR$(27);"[<p1>;<p2>G";

ESC [p1 ; pn... m **SGR (Select Graphic Rendition):** Selects font style and enhancements (bold and underline). One font designator plus any number of enhancements can be entered in the escape sequence using the parameter values in the following table. If the requested font is not installed, the default font is selected.

Parameter	Enhancement
0	Cancel all print enhancements
1	Bold (enhancement)
4	Underline (enhancement)
5	Double Wide
21	Underline
22	Cancel Bold
24	Cancel Underline
25	Cancel Expanded
26	Cancel Proportional

Parameter	Font
10	Default Font - Data Processing
11	Gothic Draft Font
12	Character Graphics
13	Gothic NLQ Font
14	Courier NLQ Font
15	High Speed Draft Font
16	OCR-A
17	OCR-B
18	Italic NLQ Font or Download A*
19	Correspondence or Download B*

ESC [p1 ; p ... m **(continued)**

*A download font (if loaded) overrides any other font. See Character Map Load on page 23.

Examples:

For Gothic NLQ font underlined send:

ESC [4 ; 13 m

To cancel underlining and retain Gothic NLQ - send one of the following:

ESC [; 13 m
ESC [0 ; 13 m
ESC [0 m
ESC [24m

Decimal: 27 91 <p1> ; <pn> m
Hex: 1B 5B <p1> 3B ... <pn> 6D
BASIC: CHR$(27);"[<p1>;...<pn> m";

ESC [p1; ... pn h

SM (Set Mode): Sets the mode or modes specified by the parameters listed below. Parameters preceded by the 'greater than' sign are privately defined modes and should be sent separately.

Parameter Number	Mode Mnemonic	Mode Function
20	LNM	Line Feed New Line Mode

LNM - Line Feed New Line Mode. When using this mode, a received line feed command causes a carriage return (new line). When LNM is reset, a line feed command only causes a vertical position movement.

The following parameters are privately defined modes.

Parameter Number	Mode Mnemonic	Mode Function
>1	GENPRM	Proportional Print Mode
>2	GENC1C	C1 Control Code Mode
>5	GENCS2	Character Set 2 Mode

GENPRM (Proportional Print Mode): Enables proportional printing. This mode does not apply to the oversize character feature. When reset (default), characters are spaced at the current cpi.

GENC1C (C1 Control Code Mode - PC Set 1): When set, it allows the use of C1 control codes. When reset, 80H - 9FH are ignored. See Appendix E for an explanation of how character sets are mapped. The default state is set using ANSI emulation option 6 (see Appendix D, ANSI (4800) or ANSI (4410) Tables).

GENSC2 (Character Set 2 Mode - PC Set 2): Selects character set 2 of any of the 8-bit international character sets. See PC Set 2 in Appendix H for an explanation of how character sets are mapped. The default state is set using option strap 7 in the ANSI emulation options (see Appendix D, ANSI (4800) or ANSI (4410) Tables).

EXAMPLE: To print proportional, send ESC [> 1 h.

Decimal: 27 91 62 49 104
Hex: 1B 5B 3E 31 68
BASIC: CHR$(27);"[>1h";

ESC [p1 ... pn l

RM (Reset Mode): Resets any modes turned on by the Set Mode command above. Parameters and syntax are the same.

ESC] 5

BFL (Begin Font Load): This sequence is not honored when self-test determines that the download font option is not installed. Permits downloading of customer-defined font characters into printer nonvolatile memory from the host. Loading is terminated when an ESC \ sequence is received.

Decimal: 27 93 53
Hex: 1B 5D 35
BASIC: CHR$(27);"]5";

ESC [p1 SP }

GENDFC (Download Font Control): Using the serial interface, this command allows the host to see if at least one valid font is loaded (p1=2). The printer sends DCS 30H 30H ST if a font is loaded, DCS 44H 45H ST if no font is loaded. It also provides the capability to erase the download font area (p1=1).

Decimal: 27 91 <p1> 32 125
Hex: 1B 5B <p1> 20 7D
BASIC: CHR$(27);"[<p1>}";

GRAPHICS

The ANSI emulation graphics mode provides both horizontal and vertical dot plotting methods. These methods enable the printing of ASCII characters in their binary code form. Since each character has a unique pattern of 1s and 0s (dots and voids) that make up its binary code, the correct placement of these binary forms enables you to form larger images on the paper.

For clarity in the text, a binary 1 (a printed dot) is shown as an X and a binary 0 (empty dot position) will be shown as a 0.

Six-Bit Graphics

In the graphics mode, only the low order six bits of a character are used (bits 1-6). Looking at an ASCII code chart, the question mark character (?) is represented by the binary number 1111110 (bit 1 - bit 7). Since only the first 6 bits are used. a "?" prints six dots on the paper. An asterisk "*" is represented by 010101 which prints the following:

Horizontal Graphics	Vertical Graphics
0X0X0X	0 X 0 X 0 X

Notice that in horizontal graphics the character is printed on a single horizontal dot row. In vertical graphics, the character is printed six dots high, one character per dot column.

Using the question mark that prints all dots, a series of these characters in horizontal graphics produces a one-dot-high solid line across the paper. The same character in vertical graphics produces a six-dot high band across the paper.

By repeating, omitting and mixing characters across a page, images such as graphs, charts, and pictures can be produced.

Dot Patterns and Densities

The chart on the next page shows the dot patterns for each of the ASCII characters. Each character represents six dots or dot positions, and their spacing is dependent on the density selected. At 60 dpi density, the dots are spaced 1/60 inch apart. At 120 dpi, each character represents six dots spaced 1/120 inch apart.

This chart shows the dot patterns for the ASCII characters needed to cover all dot/void combinations. Other valid characters (although they are repeat patterns of the characters in the chart) are 20H-3FH.

Character	Value	Dots	Character	Value	Dots
@	40H	000000	’	60H	00000X
A	41H	X00000	a	61H	X0000X
B	42H	0X0000	b	62H	0X000X
C	43H	XX0000	c	63H	XX000X
D	44H	00X000	d	64H	00X00X
E	45H	X0X000	e	65H	X0X00X
F	46H	0XX000	f	66H	0XX00X
G	47H	XXX000	g	67H	XXX00X
H	48H	000X00	h	68H	000X0X
I	49H	X00X00	i	69H	X00X0X
J	4AH	0X0X00	j	6AH	0X0X0X
K	4BH	XX0X00	k	6BH	XX0X0X
L	4CH	00XX00	l	6CH	00XX0X
M	4DH	X0XX00	m	6DH	X0XX0X
N	4EH	0XXX00	n	6EH	0XXX0X
O	4FH	XXXX00	o	6FH	XXXX0X
P	50H	0000X0	p	70H	0000XX
Q	51H	X000X0	q	71H	X000XX
R	52H	0X00X0	r	72H	0X00XX
S	53H	XX00X0	s	73H	XX00XX
T	54H	00X0X0	t	74H	00X0XX
U	55H	X0X0X0	u	75H	X0X0XX
V	56H	0XX0X0	v	76H	0XX0XX
W	57H	XXX0X0	w	77H	XXX0XX
X	58H	000XX0	x	78H	000XXX
Y	59H	X00XX0	y	79H	X00XXX
Z	5AH	0X0XX0	z	7AH	0X0XXX
[	5BH	XX0XX0	{	7BH	XX0XXX
\	5CH	00XXX0	|	7CH	00XXXX
]	5DH	X0XXX0	}	7DH	X0XXXX
^	5EH	0XXXX0	~	7EH	0XXXXX
_	5FH	XXXXX0	?	7FH	XXXXXX

Legend: X=dot 0=no dot (void)

Horizontal Format

Graphics data printed in horizontal format is comprised of a stream of bytes from left to right across each dot row.

This chart shows that byte 1 (or character 1) in row 1 prints its six bits from left to right in a single dot row. The next byte (byte 2) prints its six bits, representing a character, in the same dot row across the page.

Byte➔ Row ⬇	Byte 1	Byte 2	Byte n
1	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6
2	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6
3	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6
.	. . . . . .	. . . . . .	…. . . . . .
.	. . . . . .	. . . . . .	…. . . . . .
6	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6

Vertical Format

In vertical format, each byte (or character) occupies six dot rows of one column. Each character is one dot wide and six dots high. The next character (byte 2) is printed beside the first, moving from left to right across the page.

Byte➔	1	2	3	…n
Row	bit	bit	bit	…bit
1	1	1	1	…1
2	2	2	2	…2
3	3	3	3	…3
4	4	4	4	…4
5	5	5	5	…5
6	6	6	6	…6

Eight-Bit Graphics

Horizontal Format

Graphics data printed in horizontal format is comprised of a stream of bytes from left to right across each dot row.

This chart shows that byte 1 (or character 1) in row 1 prints its eight bits from left to right in a single dot row. The next byte (byte 2) prints its eight bits, representing a character, in the same dot row across the page.

Byte➔ Row ⬇	**Byte 1**	**Byte 2**	**Byte n**
1	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	…1 2 3 4 5 6 7 8
2	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	…1 2 3 4 5 6 7 8
3	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	…1 2 3 4 5 6 7 8
.	. . . .	. . . .	…. . . . . .
.	. . . .	. . . .	…. . . . . .
8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	…1 2 3 4 5 6 7 8

Vertical Format

In vertical format, each byte (or character) occupies six dot rows of one column. Each character is one dot wide and six dots high. The next character (byte 2) is printed beside the first, moving from left to right across the page.

Byte➔	**1**	**2**	**3**	**…n**
Row	**bit**	**bit**	**bit**	**…bit**
1	1	1	1	…1
2	2	2	2	…2
3	3	3	3	…3
4	4	4	4	…4
5	5	5	5	…5
6	6	6	6	…6
7	7	7	7	…7
8	8	8	8	…8

Other Graphics Considerations

In horizontal format, an LF causes the paper to advance one or two dot rows based on the vertical dot density, regardless of whether 6-bit or 8-bit graphics has been selected.

In vertical format, the paper is advanced as the dot rows (6 or 8, depending on graphics mode) are printed.

Graphics Sequences

ESC P

DCS (Device Control String): Enters dot graphics mode at the density and format previously selected by the ESC [<p1> ;<p2> ; <p3> q sequence. Following this sequence, the printer prints discrete dots and leaves spaces based on the 1s and 0s in the low order six bits of each byte received. forming graphic dot rows from left to right. To exit from dot graphics mode, use ESC \.

While in graphics mode (after ESC P and before the ESC \ sequence), 8-bit graphics can be printed instead of 6-bit by using one of the following sequences:

ESC " 1 n1 <data bytes>	60 dpi horizontal
ESC " 2 n1 <data bytes>	120 dpi horizontal
ESC " 3 n1 <data bytes>	Uses current horizontal and vertical density.

n1	number of data bytes to follow
<data bytes>	n1 bytes of graphics data

When the number of bytes of 8-bit data specified by n1 have been processed, and prior to receiving an ESC \ sequence, the data will print as 6-bit graphics.

Decimal:	27 91 80
Hex:	1B 5B 50
BASIC:	CHR$(27);"P";

ESC [p1 b

REP (Repeat Text or Dot Graphics Character): Repeats the single preceding character p1 times. If p1 is 0 or unspecified, it is set to 1. The maximum value for p1 is 32,767.

Decimal:	27 91 <p1> 98
Hex:	1B 5B <p1> 62
BASIC:	CHR$(27);"[<p1>b";

ESC [p1 ; p2 ; p3 q **GENGRM – Select Graphics Mode:** Selects the graphics mode, format, and horizontal or vertical density for dot graphics.

IMPORTANT

This sequence must be sent before entering the graphics mode with ESC P.

The first parameter selects the graphics mode: the second parameter selects the vertical spacing, and the third selects the horizontal dot spacing.

p1 value	Selects Graphics Format
null	Reserved: Vertical format 60h x 72v if no <p2> or <p3>
0	Reserved: Vertical format 60h x 72v if no <p2> or <p3>
1	Reserved: Vertical format 120h x 72v if no <p2> or <p3>
2	Reserved: Vertical format 120h x 144v if no <p2> or <p3>
3	Reserved: Sequence ignored
4	Horizontal format 60h x 72v if no <p2> or <p3>
5	Similar to 4, above, if <p3> = 5, 6, or 7, else ignore
6+	Reserved: Sequence ignored

Note: <p2> and <p3> are ignored in this mode.

p2	Selects Vertical Density
null	72dpiv (p1=4 only)
0-6	144dpiv
7+	72dpiv

p3	Selects Horizontal Density
null	60dpih (p1=4 only)
0-3	Reserved: Leave current value unchanged
4	Reserved: Leave current value unchanged
5	Reserved: 120dpih
6-7	120dpih
8-10	Reserved: 60dpih
11+	60dpih

Decimal: 27 91 <p1> <p2> <p3> 112
Hex: 1B 5B <p1> <p2> <p3> 70
BASIC: CHR$(27);"[<pl><p2><p3>q";

ELECTRONIC VERTICAL FORMAT UNIT - EVFU

Downline vertical tab loading is accomplished through the EVFU. The EVFU allows loading a form table with a minimum form length of .33 inches (240 decipoints) and a maximum length of 24 inches (17,280 decipoints).

Since the maximum length is 24 inches, the number of lines is dependent on the lpi setting. 3 lpi = 72 lines. 4 lpi = 96 lines. 6 lpi = 144 lines, and 8 lpi = 192 lines. Exceeding the maximum causes a fault.

Downloading the EVFU

- The vertical format type must be set to VtType:Emul VFU through the control panel using the Program Mode.
- No paper instruction lead (PI) is required.
- When the printer has an EVFU table loaded, VFU is displayed on the control panel.

ESC] ! **Start EVFU table loading sequence**. Each line of the form requires an entry. Dummy values (filler codes - See Table of Channel Codes on page 5-30) are required in lines with no channel. Two bytes are required for each line of the form. Loading Is terminated by the ESC \ sequence.

Decimal: 27 93 33
Hex: 1B 5D 21
BASIC: CHR$(27);"]!";

Loading the Table

The first table location is normally loaded with the channel 1 code. This is defined as the top-of-form (TOF) channel. The table may be left without channel 1, and a command to skip to channel 1 will cause a normal form feed as though there were no VFU. Two bytes are loaded for each line of the form to be controlled. One or more channel numbers may be indicated in the two-byte code.

The format of two-byte channel control code is:

Bit Number	8	7	6	5	4	3	2	1
Channel Number	x	one	6	5	4	3	2	1
First Byte	x	one	y	y	y	y	y	y

Bit Number	8	7	6	5	4	3	2	1
Channel Number	x	one	12	11	10	9	8	7
Second Byte	x	one	y	y	y	y	y	y

y: 0 = no stop in channel
1 = stop in channel

x: bit has no meaning

NOTE
To make characters acceptable, bit 7 must be set.

Each "channel control code" pair of bytes has the capability to indicate multiple channels since each channel indication has a unique bit position, which is either ON=1 or OFF=0.

TABLE OF CHANNEL CODES

Decimal Value		Binary Value		ASCII Character		
1	2	1	2	1	2	Remarks
64	64	1000000	1000000	@	@	Fillers: see Note
65	64	100000**1**	1000000	A	@	Channel 1
66	64	10000**1**0	1000000	B	@	Channel 2
68	64	1000**1**00	1000000	D	@	Channel 3
72	64	100**1**000	1000000	H	@	Channel 4
80	64	10**1**0000	1000000	P	@	Channel 5
96	64	1**1**00000	1000000	`	@	Channel 6
64	65	1000000	100000**1**	@	A	Channel 7
64	66	1000000	10000**1**0	@	B	Channel 8
64	68	1000000	1000**1**00	@	D	Channel 9
64	72	1000000	100**1**000	@	H	Channel 10
64	80	1000000	10**1**0000	@	P	Channel 11
64	96	1000000	1**1**00000	@	`	Channel 12

BASIC Programming Example for EVFU Table Loading

	PROGRAM INSTRUCTION	REMARKS
1500	WIDTH "LPT1:" 255	Required by some BASIC languages to avoid auto LF at column 80
1510	LPRINT CHR$(27);"]l";	Enables EVFU loading.
1520	LPRINT CHR$(65);CHR$(64);	Resets TOF, Channel 1 Sao Table of Channel Codes
1530	FOR I=1 to 4	
1531	LPRINT CHR$(64);CHR$(64);	4 filler lines
1532	NEXT I	
1540	LPRINT CHR$(68);CHR$(64);	Selects Channel 3. See Table of Channel Codes
1550	FOR I=1 to 16	
1551	LPRINT CHR$(64);CHR$(64);	16 filler lines
1552	NEXT I	
1560	LPRINT CHRS$72);CHR$(64);	Selects channel 4. See Table of Channel Codes
1570	FOR I=1 to 31	
1571	LPRINT CHR$(64);CHR$(64);	31 filler lines
1572	NEXT I	
1580	LPRINT CHR$(80);CHR$(64);	Selects channel 5. See Table of Channel Codes
1590	FOR I=1 to 8	
1591	LPRINT CHR$(64);CHR$(64);	8 filler lines
1592	NEXT I	
1600	LPRINT CHR$(64);CHR$(66);	Selects channel 8. See Table of Channel Codes
1610	LPRINT CHR$(27);"\";	Exit EVFU loading.
1620	END	

EVFU Default

The default EVFU will be generated based on the current form length and lpi setting under the following conditions:

- When the printer is initialized
- When either the forms definition or lpi setting is changed
- When the start EVFU load escape sequence ESC] is immediately followed by the end load sequence ESC \
- When the emulation is changed from P Series or Dataproducts, to ANSI

The following chart shows how the default EVFU table is defined:

CHANNEL	DESCRIPTION
1	Top Margin (first line
2	Bottom Margin (last line)
3	Single Spacing
4	Double Spacing
5	Triple Spacing
6	Half Form
7	Quarter Form
8	Tenth Line
9	Bottom of Form (bottom margin)
10	Bottom of Form minus 1 line
11	Top of Form minus 1 line (last line this form)
12	Top of Form

Skip to Channel Command

ESC [p1 ; p2 ! p **GENVFU (VFU Channel Command):** Commands vertical paper movement to the channel specified by the number formed by p1 and p2. Valid channel numbers are in the range 1- 12.

0;1 - selects channel 1
0;9 - selects channel 9
1;1 - selects channel 11

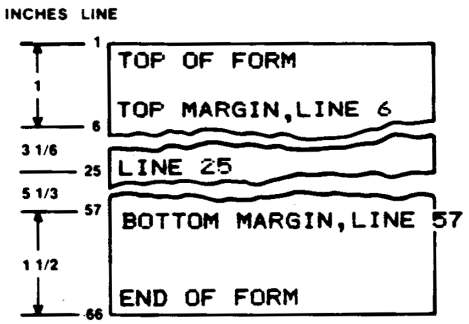
Channel 1 is always used for TOF; channel 12 is always used for vertical tab. When the channel number is greater than 12, the program defaults to channel 1. If the table has not been loaded and a channel command is received, it is ignored.

Decimal: 27 91 <p1> ; <p2> ! 112
Hex: 1B 5B <p1> 3B <p2> 21 70
BASIC: CHR$(27);"[<p1>;<p2>!p";

BASIC Programming Example for Skip to Channel

This is a sample program showing the use of the skip-to-channel command. It makes use of the previously loaded EVFU program.

PROGRAM INSTRUCTION		REMARKS
10	WIDTH “LPT1:”,255	Required by some BASIC languages to avoid auto LF at column 80
20	LPRINT CHR$(27);”[0;1!p”;	Go to top of form (channel 1)
30	LPRINT “TOP OF FORM”;	Print the indicated words
40	LPRINT CHR$(27);”[0;3!p”;	Go to channel 3
50	LPRINT “LINE 6”;	Print the indicated words
60	LPRINT CHR$(27);”[0;4!p”;	Go to channel 4
70	LPRINT “LINE 25”;	Print the indicated words
80	LPRINT CHR$(27);”[0;5!p”;	Go to channel 5
90	LPRINT “LINE 57”;	Print the indicated words
100	LPRINT CHR$(27);”0;8!p”;	Go to channel 8
110	LPRINT “END OF FORM”;	Print the indicated words
120	END	



NOTE

Establish Top of Form locally before printing forms. When executing the program, paper slews to the top of the next form before beginning to print.

BAR CODES

Thirteen different styles of bar codes and POSTNET are available. Each style (except POSTNET) can be rotated 90, 180, or 270 degrees and printed with or without a human-readable line (HRL). The bar code symbol size and density are also adjustable.

NOTE
Control sequences given in the following text show the proper syntax needed from the host. The second line has examples of code written in the BASIC program language.

Entering and Exiting Bar Codes

Before the printer can print input data as bar code symbols, the bar code mode must be both selected and activated. There are two ways for this to be accomplished depending on the setting of printer option 1 for both 4800 and 4410 ANSI emulation.

SETUP | FORMAT | MODIFY FORMAT | GENPRTOPTS | ANSI | Printer Option 1 (See Appendix G, Tables 5 and 6) is used to enable the SI (shift in) and SO (shift out) ASCII codes to activate and deactivate special mode functions. In this case, the special mode function is bar codes. With Option 1 enabled, code SO will turn on or activate the bar code mode. SI will turn bar codes off.

ANSI 4800/4410 Strap 1 OUT

Enter the bar code mode of printing with the following control sequence sent by the host. (See Appendix D for strapping options.)

ESC [3 t
LPRINT CHR$(27)*."[3t";

Data sent after the above sequence is interpreted and printed as bar codes.

Exit the bar code mode using:

ESC [0 t
LPRINT CHR$(27);"[0t";

ANSI 4800/4410 Strap 1 IN

(See Appendix D for strapping options.)

ESC [3 t
LPRINT CHR$(27);"[3t";
Selects the bar code special mode.

SO
LPRINT CHR$(14);
Activates bar codes and prints all received data as bar codes. (Only after it has been selected by ESC [3 t above.)

SI
LPRINT CHR$(15);
Deactivates bar codes and allows printing of normal text.

ESC [0 t
LPRINT CHR$(27);"[0t";
Deselects bar codes.

When an ESC [0 t is received before the SI code, bar codes are both deactivated and deselected.

Setting Bar Code Parameters

Select the style, height, spacing, orientation, and print density for the bar code using the following escape sequence. The second line in the example (written in BASIC) shows the parameters that are the default values for the printer.

ESC [<p1>;<p2>;...;<p10>}

Example
LPRINT CHR$(27);"[4;9;1;2;6;2;6;2;0;0}";

p1: Style			
0	Interleaved 2 of 5	10	Codabar b/n
1	(Reserved for future use)	11	Codabar c/*
2	(Reserved for future use)	12	Codabar d/e
3	(Reserved for future use)	13	UPC-A
4	Code 3 of 9 (default)	14	UPC-E
5	EAN-8	15	Code 93
6	EAN-13	16	Code 128 (A, B, C)
7	Code 11	17	(Reserved for future use)
8	(Reserved for future use)	18	(Reserved for future use)
9	Codabar a/t	50	POSTNET (see note)

NOTE
When using POSTNET, parameters <p2> through <p10> are invalid. If these parameters are changed, they will be retained in memory and will affect other styles if selected. See Appendix F for more information on POSTNET.

Bar Code Dimensions

NOTE
The following dimensions are for barcodes printed at 0 and 180 degrees rotation. Barcodes printed at 90 or 270 degrees rotation will be compressed by a 6:5 ratio due to the difference in size of the horizontal and vertical grids.

p2 Bar code height in 1/12-inch increments

Minimum: 1=l/12 inch
Maximum: 120=10 inches
Default: 9=9/12 inch (3 / 4 inch)
Human-readable line is not included in height.

p3 Human-readable line

0=Do not print human-readable line
1=Print human-readable line (default)

p4 Narrow bar width, number x 1/120 inch

Default: 2 (2/120 inch, approximately .017 inch)
Range: 2, 4, 6, . . . 126

p5* Wide bar width, number x 1/120 inch

Default: 6 (6/120 inch, approximately . 050 inch)
Range: 2, 4, 6, . . . 254

p6 Narrow space width, number x 1/120 inch

Default: 2 (2/120 inch, approximately . 017 inch)
Range: 2. 4, 6, . . .126

p7* Wide space width, number x 1/120 inch

Default: 6 (6/120 Inch. approximately .050 inch)
Range: 2, 4, 6, . . . 254

p8* Intercharacter space width, number x: 1/120 inch

Default: 2 (2/120 inch, approximately . 017 inch)
Range: 2, 4, 6 . . . 126

* Parameters <p5>, <p7>, and <p8> are not programmable in some bar code styles since they are generated from other parameters.

p9 Bar code rotation and human-readable line (HRL) font style (if used).

0 No rotation - use currently selected font style, cpi, and lpi. This is the default setting.

1 No rotation - use special HRL font.

2 90-degree rotation use special HRL font

3 180-degree rotation use special FIRL font.

4 270-degree rotation use special HRL font.

p 10 Horizontal print density

0 60 dpi horizontal by 144 dpi vertical print density
1 120 dpi horizontal by 144 dpi vertical print density

Default for bar code styles 5, 6, 13, and 14 is 120 dpi.
Default for all other styles is 60 dpi.

Bar codes printed at 90 or 270 degrees rotation will print at the same speed (120 x 144) regardless of the selected horizontal density.

IMPORTANT
If no parameters have previously been entered, then the factory default values will be used. If previous values have been sent from the host, these values will prevail until changed by the host or the printer is initialized.

A missing parameter will leave the corresponding value unchanged.

A zero parameter value for p2–p8 will cause the default value to be selected.

Use semicolons as place holders when changing parameters.

```
LPRINT CHR$(27);"[;;;;;;;;;1}"  Changes only parameter 10.
LPRINT CHR$(27);"15;;0}"        Changes only parameters 1 and 3.
LPRINT CHR$(27);"[16}"          Changes only the style of the bar code.
```

If no changes are made to the parameters of the bar code, the printer will use the following factory-set values.

Default Bar Code Characteristics

p1=4 Code 39
p2=9 3/4 inch height
p3=1 Human-readable line printed
p4=2 Narrow bar width 1/60 inch
p5=6 Wide bar width 1/20 inch
p6=2 Narrow space width 1/60 inch
p7=6 Wide space width 1/20 inch
p8=2 Intercharacter space width 1/60 inch
p9=0 No rotation, use currently selected font
p10=0 Horizontal print density 60 dpi

Human-Readable Line (HRL)

The human-readable line is printed 0. 10 inch below the bar code symbol. The height of the HRL and the 0.10 inch space are not included in the bar code height parameter (p2).

A diamond symbol appearing in the human-readable line indicates one of the following conditions:

• Margin overrun. The data to be printed exceeds the available space remaining inside the programmed margins.

• The DEL character has been received while printing in a bar code style that permits the use of all 128 ASCII characters.

• An invalid character has been received. An example of this would be a letter "A" sent to the printer while printing a style 5 bar code. Style 5 (EAN-8) only accepts the digits 0-9.

Font Styles and Enhancements

Non-rotated bar codes can be printed with an HRL in any of the fonts available to the printer.

If enhancements are desired (e.g., bold, underline, or expanded) the HRL must be printed using the normal text mode. Print the bar code symbol(s) without the HRL first. Exit the bar code mode and print the HRL using the normal text mode with enhancements.

Rotated bar codes use a special font for the human-readable line.

Spacing and Bar Code Editing Aids

There is a 0.25-inch space called a quiet zone at the beginning and end of every bar code. As a result, the minimum distance between two horizontal bar codes is 0.50 inch.

Most bar code styles accept commas. spaces, and horizontal tabs as delimiters to separate bar codes. A comma adds no additional space between bar codes, so the separation is the width of the quiet zone or 0.50 inch. A space character adds 0.10 inch to the quiet zone for a total of 0.60 inch separation. A horizontal tab adds the appropriate number of empty spaces to go to the next tab.

Bar Code Readability Statement

The following information is provided to ensure that the best results are obtained from your printed bar codes.

Use bar code readers designed to operate in the visible light frequency range. Optional infrared-readable ribbon cartridges are available.

Use bar code readers designed to read medium- or low-density bar code symbols. Avoid readers with apertures less than 7 mils (.007 inch or .18 mm).

Using bar code size parameters smaller than the default settings may produce unacceptable results.

Bar Code Program Examples

The following program examples are provided to help you become familiar with the bar code escape sequences. The programs are written in BASIC and printed using the LUST command. All bar codes are actual size.

Test Program

This is the minimum code needed to print a bar code. Use it to test the printer's ability to print bar codes when more complicated programs are not producing results.

Line 10 turns on the bar code mode. line 20 contains the data to be printed as a bar code symbol, and line 30 turns off the bar code mode.

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHRS(27); "[0t";
```

Error Symbol

This example shows the error symbol in the HRL and the error pattern in the symbol. The error pattern causes the entire symbol to be rejected by the bar code reader.

The error was caused by the lowercase "a" being inserted into the data. The default style, Code 3 of 9. accepts only uppercase A-Z, the numbers 0-9, and the characters -, ., $, /, + and %.

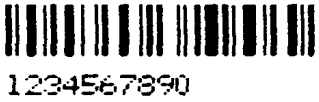
```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1a34567890";
30 LPRINT CHR$(27); "[0t"
```

Changing Parameters

This example changes the style p1, height p2, and the HRL font p9 of the bar code. Notice that semicolons are used as place holders for the parameters not being changed.

Line 10 - changes style to Code 128, changes height to 1/4" (3/12"). and use the special HRL font.

```
10 LPRINT CHR$(27);"[16;3;;;;;;;1;}
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234567890";
40 LPRINT CHR$(27); "[0t"
```



Commas and Spaces as Delimiters

When a comma delimiter is used to separate bar codes, no additional space Is added to the quiet zones. Since the ending .25-inch quiet zone of one bar code symbol meets the beginning quiet zone of the next bar code, a total of .50-inch separates the two. Style 7 (line 5) is used for these examples since Code 11 uses both spaces and commas as delimiters.

```
10 LPRINT CHR$(27); "[7}";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234,56,7890";
40 LPRINT CHR$(27); "[0t"
```

When spaces are used as delimiters, an additional 1-inch is added to the quiet zones. Note that multiple spaces can be used.

```
10 LPRINT CHR$27); "[3t"
20 LPRINT "1234       56   7890";
30 LPRINT CHR$27); "[0t"
```

Horizontal Spacing

Use horizontal tabs for spacing bar code symbols across the page. Line 10 sets horizontal tabs at 1440 and 2880 decipoints (2 and 4-inches). The HT codes in lines 40 and 60 cause a jump to the next tab.

```
10 LPRINT CHR$(27); "[1440;2880;u";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234";
40 LPRINT CHR$(9);
50 LPRINT "5678";
60 LPRINT CHR$(9);
70 LPRINT "9012";
80 LPRINT CHR$(27); "[0t"
```

When no horizontal tabs are set, an HT code acts as a space, adding 0.1 inch to the separation. Total separation is 0.6 inch when the HT is added to the quiet zones.

Line 10 clears all previously set horizontal tabs for this example.

```
10 LPRINT CHR$(27); "[3g";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234";
40 LPRINT CHR$(9);
50 LPRINT "5678";
60 LPRINT CHR$(9);
70 LPRINT "9012";
80 LPRINT CHR$(27); "[0t"
```

Printer Option Strap 11, Group 2 IN

Printer control strap 11 is used for positioning the paper after printing a bar code. Strap 11 IN sets the paper to the top of the bar code after printing; Strap 11 OUT leaves the paper position as is after printing a bar code. (See Appendix D for a complete listing of options available.

The state of strap 11 can be checked and changed using the setup menu.

In the following examples, lines 10 to 30 print the bar code symbol and line 40 adds a line of text to be printed.

Examples 1 and 2 show the effect strap 11 has on the position of the text.

In example 3, the semicolon at the end of line 30 has been deleted to show that Strap 11 only affects the same horizontal zone that the bar code occupies. The semicolon in BASIC is used to suppress a LF/CR after an LPRINT statement.

IMPORTANT

Strap 11 is only effective after exiting the bar code mode. As in the printout above, printing multiple bar codes without exiting (line 80 above) causes all the bar codes to be printed in the same horizontal area of the paper regardless of the condition of strap 13. Also, some form of printable data must be on the line before a paper move command (see line 40 in the examples); if not, the paper will not backup to the top of the bar code.

EXAMPLE 1: Strap 11 OUT

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHR$(27); "[0t";
40 LPRINT "STRAP 11 OUT"
```

1234567890 STRAP 11 OUT

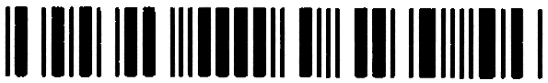
EXAMPLE 2: Strap 11 IN

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHR$(27); "[0t";
40 LPRINT "STRAP 11 IN"
```

1234567890 STRAP 11 IN

EXAMPLE 3: Strap 11 OUT with no suppression of LF/CR on line 30

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHR$(27); "[0t"
40 LPRINT "STRAP 11 OUT"
```



1234567890

STRAP 11 OUT

Vertical Bar Codes

- Line 10 sets parameter p9 for 90-degree rotation using the special font for the HRL.
- Line 20 turns on the bar code mode.
- Line 30 is the data to be printed as a bar code symbol.
- Line 40 turns off the bar code mode.

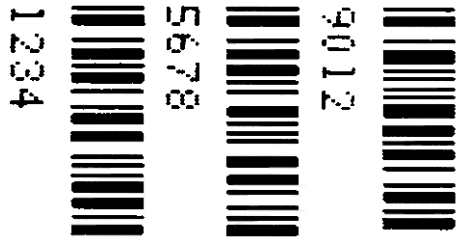
```
10 LPRINT CHR$(27); "[;;;;;;;;2}";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "12345";
40 LPRINT CHR$(27); "[0t"
```

Commas and spaces used as delimiters serve the same function as in horizontal bar codes. However, the quiet zones rotate with the symbol, leaving almost no horizontal separation between bar codes on the same line.

In the following examples, line 10 is used to print or inhibit the printing of the HRL (p3).

COMMAS: With HRL

```
10 LPRINT CHR$(27);"[;;1}";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234,5678,9012";
40 LPRINT CHR$(27); "[0t"
```



COMMAS: Without HRL

```
10 LPRINT CHR$(27); "[;;0}";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234,5678,9012";
40 LPRINT CHR$(27); "[0t"
```

SPACES: With HRL

```
10 LPRINT CHR$(27);"[;;1}";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234              5678   9012";
40 LPRINT CHR$(27); "[0t"
```

SPACES: Without HRL

```
10 LPRINT CHR$(27); "[;;0}";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234                    5678   9012";
40 LPRINT CHR$(27); "[0t"
```

Horizontal Tabs

- Line 10 sets horizontal tab stops at 1080 and 2160 decipoints (1. 5 and 3 inches).
- Lines 40 and 60 are ITT codes that cause a jump to the next tab stop.

Line 90 is a line of text to show positioning on the paper. The vertical separation between the bar code symbol and the text "TEXT STRAP 13 OUT" is the ending quiet zone.

```
10 LPRINT CHR$(27); "[1080;2160;u";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "12345";
40 LPRINT CHR$(9);
50 LPRINT "12345";
60 LPRINT CHR$(9);
70 LPRINT "12345";
80 LPRINT CHR$(27); "[0t";

90 LPRINT "TEXT STRAP 13 OUT"
```

OVERSIZE CHARACTER FONT

The oversize font is composed of special block-style characters that can be expanded 156 times the size of standard fonts. This will produce letters up to 15.25-inches (388mm) high by 13 inches (330mm) wide. Oversize characters can be rotated 90, 180, or 270 degrees.

Do not confuse oversize characters with expanded characters. The expanded character feature, (standard in your printer), expands all existing fonts up to 8 times the normal size. These characters are not rotatable.

The oversize character feature works with the ANSI protocol.

Entering and Exiting Oversize

The following sequences are used to enter, rotate, and exit oversize printing:

ESC [0 | Exit oversize printing.
ESC [1 | Select oversize font with no rotation.
ESC [2 | Select oversize font with 90-degree rotation.
ESC [3 | Select oversize font with 180-degree rotation.
ESC [4 | Select oversize font with 270-degree rotation.

```
LPRINT CHR$(27);"[0|";                or
LPRINT CHR$(27);"[0|";CHR$(124);
```

Once oversize has been turned on, it will remain on until an ESC [0 | sequence is used to turned it off. It does not turn off due to line terminators (CR and LF).

NO ROTATION 90-DEGREE ROTATION 180-DEGREE ROTATION 270-DEGREE ROTATION

Selecting Size

ESC [p1;p2 B is the sequence used to set the vertical (p1) and horizontal (p2) size of the oversize characters. A p1 value of 300 would increase the vertical size of the character 300% or 3 times.

The last two digits of each parameter are necessary to comply with the ANSI standard, but are ignored by the printer. Using the above example for p1, any three-digit number starting with 3 (300-399) will be interpreted as 3 times normal size. Likewise, 400-499 equals 4 times, 1200-1299 equals a 12-times increase in size, and so on. The maximum size is 15600;15600 (156 times) and the minimum or default is 200;200 (2 times).

Since this same sequence is used to change size in the expanded mode, the parameters must be cleared to normal size,
ESC [100 ; 100 B, to prevent entering expanded mode when oversize is turned off.

Mnemonic:	ESC [<p1>; <p2> B
Decimal:	27 91 <p1> 59 <p2> 66
Hex:	1B 5B <p1> 3B <p2> 42
BASIC:	CHR$(27);"[";<p1>;<p2>;B";

Size Parameters for Rotation

The <p1> and <p2> size parameters are always relative to a rotation angle of zero degrees. That is, the characters are expanded first and then rotated.

Spacing Between Characters

For non-rotated characters and characters rotated 180 degrees, the horizontal spacing between characters is 1/60-inch times the <p2> parameter.

For characters rotated 90 or 270 degrees, the horizontal spacing between characters is 3/60-inch times the p1 parameter.

Vertical spacing is dependent on vertical paper move commands (LF, CR, VPR, etc.), the state of menu option GenPrtOpts/Group 2/Strap 13, and the character size and line spacing currently in effect.

Sample Programs

Example 1

The first example shows the code used to print oversize.

Line 10 sets the size to X3 vertical (V) and X3 horizontal (H). Line 20 enters oversize printing with no rotation. Line 30 is the data to be printed. Line 40 exits oversize printing. Line 50 returns the size parameters to X 1 V - X 1 H.

```
10 LPRINT CHR$(27); "[300;300B";
20 LPRINT CHR$(27); "[1|";
30 LPRINT "ABCabc";
40 LPRINT CHR$(27); "[0|";
50 LPRINT CHR$(27); "[100;100B"
```

Example 2

The next two examples demonstrate the importance of setting the size parameters back to X1 V - X1 H after printing oversize. This is the same program used in Example 1 with an additional line added.

Line 60 prints 1234 in the currently selected font.

```
10 LPRINT CHR$(27); "[300;300 B";
20 LPRINT CHR$(27); "El:";
30 LPRINT "ABCabc"
40 LPRINT CHR$(27); "CO:";
50 LPRINT CHR$(27); "[100;100 B"
60 LPRINT "1234"
```

Example 3: Showing the Importance of Resetting Scaling Factors

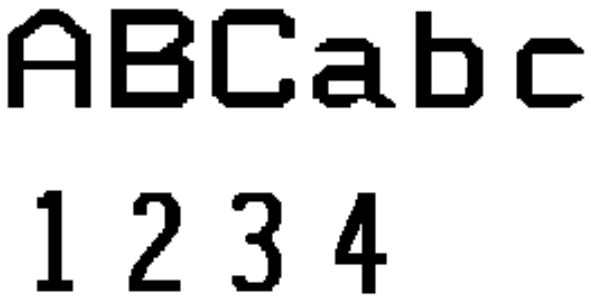
If line 50, which sets the size to X1 V and X1 H. is removed, the data printed in line 60 is now subject to the expanded mode of printing.

NOTE

In BASIC, LPRINT statements automatically generate an LF/CR at the end of the line unless suppressed by a semicolon. Since line 30 does not end with a semicolon, an LF/CR occurred at the lpi in effect (still in oversize). This accounts for the vertical distance between the ABCabc line and the 1234 line.

Notice (below) that the 1234 printed line is expanded vertically by X3

```
10 LPRINT CHR$(27); "[300;300B";
20 LPRINT CHR$(27); "[1|";
30 LPRINT "ABCabc";
40 LPRINT CHR$(27); "[0|"
60 LPRINT "1234"
```



Printer Control Strap GenPrtOpts/Group 2/Strap 13

This printer control strap is used for positioning the paper after printing oversize characters. When this strap is set to IN, the paper is positioned at the top of the oversize character after printing; when set to OUT, the paper position remains as is after printing oversize.

The state of the printer strap can be checked and changed using the configuration menu.

In the following examples:

- Lines 10-30 print oversize characters at X3.
- Line 50 changes the oversize to X4 V by X6 H.
- Lines 70-80 print oversize and exits.
- Line 90 returns the parameters to X1 to prevent expanded printing.
- Lines 100-110 print normal text to show the effect that strap 13 has on positioning.

IMPORTANT

Line spacing was set back to normal (6 lpi) when normal text was selected in line 90. When strap 13 is IN and the paper position returns to the top of oversize, vertical moves (CR, LF, VPA, VPR) must be used to move the paper to prevent overprinting on the oversize characters.

Example 4: GenPtrOpts | Group 2 Strap 13 IN

The oversize characters and the first line of normal printing are aligned at the first print line. The second line of normal printing (Text Text Text . . .) started printing one line below Strap 13 IN and overprints the oversized text.

```
100 LPRINT CHR$(27);"[300;300B";
110 LPRINT CHR$(27);"[1|";
120 LPRINT "ABC";
130 LPRINT CHR$(27);"[400;600B";
140 LPRINT "ABC";
150 LPRINT CHR$(27);"[0|";
160 LPRINT CHR$(27);"[100;100B";
170 LPRINT "Strap 13 IN";
180 LPRINT "Text   Text   Text   Text   Text   Text   Text"
```

Example 5: GenPtrOpts | Group 2 Strap 13 OUT

Paper motion is not returned after printing oversized characters.


```
100 LPRINT CHR$(27);"[300;300B";
110 LPRINT CHR$(27);"[1|";
120 LPRINT "ABC";
130 LPRINT CHR$(27);"[400;600B";
140 LPRINT "ABC";
150 LPRINT CHR$(27);"[0|";
160 LPRINT CHR$(27);"[100;100B";
170 LPRINT "Strap 13 OUT";
180 LPRINT "Text   Text   Text   Text   Text   Text   Text"
```

CHAPTER 3. PRINTRONIX P300/P600 EMULATION

INTRODUCTION

This printer is plug-compatible with the Printronix 300/600 family of line printers. It accepts and acts upon all control codes utilized by this family of printers in a manner that is as functionally equivalent as possible.

The following is a list of the control codes (and their functions) utilized by the Printronix printer. Any control codes not listed will be discarded.

When changing from the ANSI emulation to the P Series emulation. the ANSI vertical tab table does not transfer and the horizontal tab table set In the ANSI mode is not available. Ali menu parameters set before changing emulations will carry over except for these.

CONTROL CODES

ACK **Line at 8 LPI (06H):** A received **<**ACK**>** anywhere on the line causes the entire line to be printed at 8 lpi. Since this code is momentary, it will not affect subsequent lines. Each line must receive an <ACK> code for the switch to 8 lpi.

BEL **Bell Code (07H):** A <BEL> code received at the interface causes the beeper to. sound for approximately 1 second.

BS **Elongated Character Line (08H):** A <BS> code anywhere on the line causes that line to be printed at double height. Standard- and double-high characters cannot be mixed on the same line.

CR **Carriage Return Slew Zero or Edit Mode (ODH):** In the edit mode, i.e., with the P300/600 Emulation Strap 01 OUT, a <CR> will left-justify the line in the buffer, but no printing will occur. The next line of data received can then modify the line. With the strap IN, the 0 slew mode is invoked. In this mode, the line modification feature is deleted and a <CR> is treated in the same manner as in the ANSI protocol. The print control, DEFINE CR, with the definition set to CR=CR+LF converts a carriage return to a linefeed. With the definition set to CR=CR, the printer ignores received carriage returns.

DC1 **Ready/Select (11H):** A received <DC1> can be used to remotely select the printer in both serial and parallel interfaces. A serial interface protocol can be selected to transmit a <DC1> code to inform the host of a ready condition. See Appendix G for strap information.

NOTE

If a <DC1> or <DC3> control character is received with strap 8 in GenPrtOpts set to OUT, the control is treated as a VFU Channel Command. See Appendix G, General Printer Options, Group 2.

DC3 **Busy/Select (13H):** A received DC3 can be used to remotely deselect the printer in both serial and parallel interfaces. A serial interface protocol can be used to transmit a DC3 code to inform the host of a busy condition.

NOTE
If a <DC1> or <DC3> control character is received with strap 8 in GenPrtOpts Group 2 set to OUT, the control is treated as a VFU Channel Command. See Appendix D, General Printer Options, Group 2 on page 345.

DEL **Delete (7FH):** In graphics mode, the delete character is treated as data. In the edit mode, a <DEL> following a <CR> erases (replace with a space) previously accepted (buffered, but not printed) characters.

DLE **High Vertical Density Graphics (10H):** A <DLE> code preceded by an <ENQ> code anywhere on the same line causes paper motion for that line to be 1/144 inch instead of the normal 1/72 inch. If not preceded by an <ENQ> code, the <DLE> is discarded. If there are no graphics commands (EOT or ENQ) in the line, the DLE code is treated as an EVFU channel command.

ENQ **Normal Density Plot Line (05H):** An <ENQ> anywhere in the line causes the line to be treated as normal-density (60 dpi) plot mode graphics. An <LF> code causes the line to be printed as one dot row and the paper is advanced. If there is a <DLE> anywhere in the line, the paper is advanced by 1/144 inch. Otherwise, the paper is advanced by 1/72 inch.

EOT **High Density Plot Line (04H):** An EOT is used to print at 120 dpi. This code anywhere in the line causes the line to be treated as high-density plot mode graphics. The line must be terminated with a CR (printer strap A29 must be OUT). The characters are treated as dot information and the CR at the end of the line will not cause the paper to advance. The code causes dots to be printed in the even-numbered dot column positions. A second line of the same data with the normal plot mode command (ENQ) is required to fill in the remainder of the dots and to advance the paper.

ETX **End of Transmission (03H):** The ETX code is used in the serial interface with the ACK code as part of an interface protocol. The ETX is received from the host at the end of a data block. The host then stops sending data until an ACK is received.

FF **Form Feed (0CH):** A form feed causes the line to be printed and the paper advanced to the top of form.

HT **Horizontal Tab (09H):** An HT is replaced by a space character.

LF **Line Feed (0AH):** An LF causes the line to be printed and advances the paper to the next line. If the line is a plot mode line, the paper is advanced one dot row or not at all, depending on the density of the plot mode. See Printronix Mode Graphic Density Table.

RS **Record Separator (1EH):** The RS character is used to signal the beginning of an EVFU load. [Need replacement wording here for the margin notes in the tech review.]

SI	**Shift In (0FH):** An SI code anywhere in the line causes the remainder of the line and all following lines to be printed in the standard font.
SO	**Shift Out (0EH).** An SO code anywhere in the line causes the remainder of the line of the line and all subsequent lines (until an SI code is received) to be printed in the alternate font. The alternate font is selected with printer P300/600 emulation straps S13-S16, set in the GenPtrOpts function of the CCU menu.
SP	**Space (20H):** The space code causes a blank in the character position represented by the code. Following a carriage return in edit mode, space codes do not modify the contents of the print buffer. The SP is used as a skip code to pass over characters in the buffer. When using the character graphics font the character in the 20H position is printed instead of a blank.
UNDL	**Underline (5FH):** When using the legacy parallel interface, hardware strap H7 IN causes a CR to be substituted for an underline character. (See Appendix G. Hardware Straps.) All software straps that apply to a CR will apply if the option is selected.
US	**Unit Separator (1FH):** The US character is used to signal the end of an EVFU load sequence.
VT	**Vertical Tab (0BH):** A VT causes the line to be printed and paper advanced until the next tab position is reached. If the VFU is enabled, channel 12 is accessed instead.

PRINTRONIX GRAPHICS

The Printronix emulation graphics mode provides a horizontal dot placement plotting method. This method enables the printing of ASCH characters in their binary code form. Since each character has a unique pattern of 1s and 0s (dots and voids) that make up its binary code, the correct placement of these binary forms enables you to form larger images on the paper.

For clarity in the text, a binary 1 (a printed dot) Will be shown as an X and a binary 0 (empty dot position) will be shown as a 0.

In the graphics mode, only the low order six bits of a seven- or eight-bit character are used (bits 1-6). Looking at an ASCH code chart, the question mark character (?) is represented by the binary number 1111110 (bit 1 - bit 7). Since only the first 6 bits are used, a ? would print six dots on the paper. An asterisk (*) is represented by 010101 which would print 0X0X0X0 across the page horizontally.

Using the question mark that prints all dots, a series of these characters produces a one dot high solid line across the paper. By repeating, omitting, and mixing characters across a page, images such as graphs, charts, and pictures can be produced.

Dot Patterns and Densities

The chart on the next page shows the dot patterns for each of the ASCII characters. Each character represents six dots (or dot positions)* and their spacing is dependent on the density selected.

Graphics data printed in horizontal format is comprised of a stream of bytes from left to right across each dot row.

This chart shows that byte 1 (or character 1) in row 1 will print its six bits from left to right in a single dot row. The next byte (byte 2) prints its six bits, representing a character, in the same dot row across the page.

Byte➔ Row ⬇	**Byte 1**	**Byte 2**	**Byte n**
1	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6
2	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6
3	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6
.	. . . . . .	. . . . . .	…. . . . . .
.	. . . . . .	. . . . . .	…. . . . . .
6	1 2 3 4 5 6	1 2 3 4 5 6	…1 2 3 4 5 6

Dot Patterns

This chart shows the dot patterns for the ASCII characters needed to cover all dot/void combinations. Characters from 20H to 3FH provide the same patterns as characters 60H through 7FH. Characters from 00H through 1FH, which are not recognized as line terminators or plot mode codes, are ignored.

Character	Value	Dots	Character	Value	Dots
@	40H	000000	’	60H	00000X
A	41H	X00000	a	61H	X0000X
B	42H	0X0000	b	62H	0X000X
C	43H	XX0000	c	63H	XX000X
D	44H	00X000	d	64H	00X00X
E	45H	X0X000	e	65H	X0X00X
F	46H	0XX000	f	66H	0XX00X
G	47H	XXX000	g	67H	XXX00X
H	48H	000X00	h	68H	000X0X
I	49H	X00X00	i	69H	X00X0X
J	4AH	0X0X00	j	6AH	0X0X0X
K	4BH	XX0X00	k	6BH	XX0X0X
L	4CH	00XX00	l	6CH	00XX0X
M	4DH	X0XX00	m	6DH	X0XX0X
N	4EH	0XXX00	n	6EH	0XXX0X
O	4FH	XXXX00	o	6FH	XXXX0X
P	50H	0000X0	p	70H	0000XX
Q	51H	X000X0	q	71H	X000XX
R	52H	0X00X0	r	72H	0X00XX
S	53H	XX00X0	s	73H	XX00XX
T	54H	00X0X0	t	74H	00X0XX
U	55H	X0X0X0	u	75H	X0X0XX
V	56H	0XX0X0	v	76H	0XX0XX
W	57H	XXX0X0	w	77H	XXX0XX
X	58H	000XX0	x	78H	000XXX
Y	59H	X00XX0	y	79H	X00XXX
Z	5AH	0X0XX0	z	7AH	0X0XXX
[	5BH	XX0XX0	{	7BH	XX0XXX
\	5CH	00XXX0	|	7CH	00XXXX
]	5DH	X0XXX0	}	7DH	X0XXXX
^	5EH	0XXXX0	~	7EH	0XXXXX
_	5FH	XXXXX0	?	3FH	XXXXXX

Each line to be printed as graphics must have one of the three graphic control codes (ENQ, EOT, DLE) in the line of data. The ENQ and EOT codes can be placed anywhere in the line of data. When used, the DLE code must always be placed after the ENQ code.

The following densities are available using the formats shown:

Density		
Horizontal	**Vertical**	**Line Format Required**
60	72	ENQ, data, LF terminator
120	72	EOT, data, CR terminator ENQ, data, LF terminator
60	144	ENQ, DLE, data, LF terminator
120	144	EOT, data, CR terminator ENQ, DLE, data, LF terminator

The dot pattern for a particular character is the same regardless of density. The density difference is a shift to the right by 1/120 inch for high density.

Normal-Density Graphics

At 60 dpi horizontal density, one line of characters is used for each dot row. The normal density plot mode character (ENQ) can appear anywhere in the line. The line must be terminated with an LF. At the end of graphics printing, send an empty data line containing only an LF.

High-Density Graphics

At 120 dpi horizontal density, each dot row requires two lines of characters. The first line contains the high density plot mode code (EOT) and must be terminated with a CR.

IMPORTANT
The DEFINE CR setting in the printer control setup menu must be set to CR=CR.

The second line contains the normal density plot mode code (ENQ) and must be terminated with an LF.

At the end of graphics printing, send an empty data line containing only an LF for proper termination.

P300/600 8-Bit Horizontal Graphics

Horizontal	Vertical	Syntax
60	72	<ESC>"1<count><data><LF>
120	72	<ESC>"2<count><data><LF>
60	144	<ESC>"1<count><data><DLE><LF>
120	144	<ESC>"2<count><data><DLE><LF>

P300/600 ELECTRONIC VERTICAL FORMAT UNIT

The electronic vertical format unit (EVFU) is used to download vertical tabs to the printer. It allows jumps to preselected lines on the form through vertical moves of the paper.

The maximum form length is 22 inches (176 lines at 8 lpi).

Using the EVFU

Using the EVFU is a two-step process. The first step is to load the channel control table with codes for the form being used. One byte must be loaded for each line of the form. A channel code can be inserted in the byte to indicate a stop (or vertical tab location).

The second step is to send a channel command to jump to a specified channel (location on the paper).

On the following pages are charts and sample programs showing the codes for loading the EVFU table and selecting channels for paper moves.

Points to Remember

- When a table is downloaded, VFU will be displayed.
- The vertical format type must be set to Emulation VFU through the control panel using the **Setup | Vertical Format | Type Select |Emulation VFU** menu option.
- The **GenPtrOpts | Group 2** strap to enable received select/deselect must be set to OUT.
- Printer option 3 (see Table 11 in Appendix D, Printronix 300/600 Emulation Options) must be enabled to enable EVFU loading. If option 3 is not enabled when a start load RS code is received, the table will not be loaded and all control characters received before the end load US code will be interpreted as data.
- When using serial interface with the PI lead enabled, the interface settings menu must have the serial options set to **PI Lead Use 8-bit.**

Send the EVFU table at the start of a line to prevent a loss of data.

These charts contain the channel commands to load the EVFU table and for selecting a channel for vertical moves.

PI Lead Codes – Use with Serial Interface

The PI lead is not used in the parallel interface. To use the PI lead with the serial interface, 8-bit codes must be sent.

Data Lines								Channel number or Command		
PI	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**Channel**	**Decimal Number**	**ASCII**
1	X	X	0	0	0	0	0	1 TOF	128	NUL
1	X	X	0	0	0	0	1	2	129	none
1	X	X	0	0	0	1	0	3	130	none
1	X	X	0	0	0	1	1	4	131	none
1	X	X	0	0	1	0	0	5	132	none
1	X	X	0	0	1	0	1	6	133	none
1	X	X	0	0	1	1	0	7	134	none
1	X	X	0	0	1	1	1	8	135	BEL
1	X	X	0	1	0	0	0	9	136	BS
1	X	X	0	1	0	0	1	10	137	HT
1	X	X	0	1	0	1	0	11	138	LF
1	X	X	0	1	0	1	1	12 VT	139	VT
1	X	X	0	1	1	0	0	13	140	FF
1	X	X	0	1	1	0	1	14	141	CR
1	1	1	0	1	1	1	0	Start Load	238	none
1	1	1	0	1	1	1	1	End Load	239	none

Codes Not Using the PI Lead

Data Lines								Channel number or Command		
PI	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**Channel**	**Decimal Number**	**ASCII**
0	0	0	0	0	0	0	0	1 TOF	16	DLE
0	0	0	0	0	0	0	1	2	17	DC1
0	0	0	0	0	0	1	0	3	18	DC2
0	0	0	0	0	0	1	1	4	19	DC3
0	0	0	0	0	1	0	0	5	20	DC4
0	0	0	0	0	1	0	1	6	21	NAK
0	0	0	0	0	1	1	0	7	22	SYN
0	0	0	0	0	1	1	1	8	23	ETB
0	0	0	0	1	0	0	0	9	24	CAN
0	0	0	0	1	0	0	1	10	25	EM
0	0	0	0	1	0	1	0	11	26	SUB
0	0	0	0	1	0	1	1	12 VT	27	ESC
0	0	0	0	1	1	0	0	13	28	FS
0	0	0	0	1	1	0	1	14	29	GS
0	0	0	0	1	1	1	0	Start Load	30	RS
0	0	0	0	1	1	1	1	End Load	31	US

Example EVFU Loading Program

- Using standard CENTRONICS parallel interface with 36-pin connector and P Series protocol.
- Using the channel code chart without the PI lead.
- This program loads the EVFU table with channel stops at lines 6, 25, 57, and 66.
- Set the printer as follows:
- **GenPtrOpts | Group 2 | Strap 8** OUT to deactivate coded SELECT/DESELECT operation.
- Set up vertical format emulation (VFU)

PROGRAM INSTRUCTION		REMARKS
1500	WIDTH "LPT1:". 255	Required by some BASIC languages to avoid auto LF at column 80
1510	LPRINT CHR$(30);	Selects SL channel.
1520	LPRINT CHR$(16);	Selects TOF. Channel 1 1530 FOR 1=1 to 4
1530	FOR I-1 to 4	
1531	LPRINT CHR$(17);	Selects Channel 2 for 4 filler lines
1532	NEXT 1	
1540	LPRINT CHR$(18);	Selects Channel 3 (for line 6 printing)
1550	FOR 1=1 to 18	
1551	LPRINT CHR$(17);	Selects Channel 2 for 18 filler lines
1552	NEXT I	
1560	LPRINT CHR$(19);	Selects Channel 4 (for line 25 printing)
1570	FOR 1=1 to 31	
1571	LPRINT CHR$(17);	Selects Channel 2 for 31 filler lines
1572	NEXT I	
1580	LPRINT CHR$(20);	Selects Channel 5 (for line 57 printing)
1590	FOR 1=1 to 8	
1591	LPRINT CHR$(17);	Selects Channel 2 for 8 filler lines
1592	NEXT I	
1600	LPRINT CHR$(21);	Selects Channel 6 (for line 66 printing)
1610	LPRINT CHR$(31);	Selects EL Channel
1620	END	

A start load RS code immediately followed by a stop load US code will clear the EVFU table. The BASIC code to do this follows

```
10 LPRINT CHR$(30);
20 LPRINT CHR$(31);
```

Example Form Printout

This example uses the VFU table created in the previous example.

NOTE
Establish top of form locally before printing. When running the program, paper will slew to the top of the next form before printing begins.

Sample Program to Print Form

The following sample program uses the EVFU program from the prior example.

Program Instruction		Remarks
10	WIDTH “LPT1:”;255	Required by some BASIC languages to avoid auto LF
20	LPRINT CHR$(16);	Go to Top of Form (Channel 1)
25	LPRINT “TOP OF FORM”;	Print the indicated words
30	LPRINT CHR$(18);	Go to Channel 3
35	LPRINT “TOP MARGIN, LINE 6”;	Print the indicated words
40	LPRINT CHR$(19);	Go to Channel 4
45	LPRINT “LINE 25”;	Print the indicated words
50	LPRINT CHR$(20);	Go to Channel 5
55	LPRINT “BOTTOM MARGIN, LINE 57”;	Print the indicated words
60	LPRINT CHR$(21);	Go to Channel 6
65	LPRINT “END OF FORM”;	Print the indicated words
70	END	

CHAPTER 4. PRINTRONIX P-SERIES EMULATION

SPECIAL FUNCTION CONTROL CHARACTER (SFCC)

When a printer control code consists of more than one character, it is called a command or escape sequence. This emulation uses a **Special Function Control Character (SFCC)** as the first character of a command sequence. The SFCC alerts the printer that a command sequence—not printable characters follows.

- In this P-Series emulation mode, you may choose 0 to 127 to be the SFCC via the Emulation Settings of the Set Up Menu.

The general format for a command sequence in the P-Series emulation is:

SFCC (parameter 1 ..... parameter n) (terminator)

Command Line

In the P-Series emulation mode, print format, font, or international language selection can also be controlled by a longer sequence known as a Command Line. Command Lines are string type commands placed between complete lines of text and affecting the text that follows. The P-Series Emulation has six Command Lines: PMODE, OSET, PSET, LPI, LINES, and INCHES. Each of these Command Lines is discussed in this chapter under the appropriate Control Code function.

For example, you can set the form length in inches by using the following command line:

SFCC INCHES ; n f

where n is the whole number of inches and f is the fractional increment in 0.5 inch increments.

When using the SFCC in a Command Line, it must be the first non-blank symbol in the line (space, hex 20, is a blank symbol). In addition, characters following spaces (other than a valid line terminator) in a Command Line are ignored so that user comments can be included on the Command Line. The valid line terminators are Form Feed (FF), Line Feed (LF), and Carriage Return (CR); however, when used in the Command Line, these line terminators do *not* cause any paper motion.

Set and Reset Codes

Some print attributes are set and reset (turned ON and OFF) by using an SFCC command sequence and the numbers one(1) or zero(0). These numbers may be in the form of hexadecimal code 01H and 00H, or the ASCII code for the printable symbols of decimal 1 and 0 (hexadecimal code 31 and 30).

COMMAND INDEX

Command	Format	Page
Vertical Motion		
Form Feed	<FF>	81
Forms Length Set (Inches)	<SFCC> INCHES	93
Forms Length Set (Lines)	<SFCC> LINES	93
Line Feed	<LF>	81
Line Spacing 1/6 Inch (6 lpi)	<SFCC> 2 <SFCC> LPI	94
Line Spacing 1/8 Inch (8 lpi)	<SFCC> 0 <SFCC> LPI	95
Line Spacing 8 or 10.3 LPI (1 line only)	<ACK> <SFCC> f	95
Line Spacing 7/72 Inch	<SFCC> l	96
Line Spacing n/72 Inch (used with SFCC 2)	<SFCC> A	96
Vertical Tab	<VT>	97
Horizontal Motion		
Backspace	<BS>	80
Carriage Return	<CR>	80
Print Attributes		
Bold Print	<SFCC> G	84
Bold Print Off	<SFCC> H	85
Emphasized Print	<SFCC> E	85
Emphasized Print Off	<SFCC> F	86
Overscoring	<SFCC> _	90
Underline	<SFCC> -	91
Printer Control		
Bell	<BEL>	80
Emulation Reset	<SFCC> @	92
Font Control		
Download New Character Shape	(not supported)	
Double Wide (Elongated) Characters (1 line only)	<SFCC> h <BS>	86
Expanded (Double Wide) Print	<SFCC> W 1	85
Expanded (Double Wide) Print Reset	<SFCC> W 0 <DC4>	86
		continued

Font Control (continued)		
Font Selection	<SFCC> X <SFCC PMODE	89
Superscript/Subscript Printing	<SFCC> S	90
Superscript/Subscript Printing Reset	<SFCC> T	90

Plot Mode Graphics		
Plot, Even Dot (High Horizontal Density)	<EOT>	103
Plot, Odd Dot (Normal Density)	<SFCC> d <ENQ>	103
Plot, High Vertical Density (1/144)	<DLE>	102
Plot, Single Line (High Horizontal Density)	<NAK>	103

Character Set Control		
Character Set Select	<SFCC> 1	82
Character Set Select: ECMA Extended	(Not supported)	
Character Set Select: Int'l Languages	<SFCC> PSET or <SFCC> R	84
Character Set Select: Substitution Table	(Not supported)	
Execute Control Codes	<SFCC> 7	92
Print Control Codes	<SFCC> 6	92
Download a Language	(Not supported)	
Extended Character Set	<SO> <SFCC> <SO> <SFCC> n <SFCC> 4	87
Extended Character Set Cancel	<SI> <SFCC> <SI> <SFCC> o <SFCC> 5	88

CONTROL CODES

Backspace

Backspace <BS>: Moves the logical print position to the left one character space toward the first character column. When configured from the control panel for backspace, BS moves the character position one character space to the left at the current character pitch setting. This code is ignored if the logical print position is at the first character column.

Decimal: 8
Hex: 08H
BASIC: CHR$(8);

Indeterminate Conditions
This code can also be configured form the control panel to print double-high characters instead of a backspace.

Bell

Bell <Bel>: The printer's audible alarm will sound for 1/2 second when the bell code is received by the printer.

Format
<Bel>

Decimal: 7
Hex: 07H
BASIC: CHR$(7);

Indeterminate Conditions
Bell code cannot be disabled.

Carriage Return

Carriage Return <CR>: Returns the logical print position to the first character column. The CR code may or may not cause printing or paper motion, depending on the CR CODE configuration parameter value.

Format
<CR>

Decimal: 13
Hex**:** 0DH
BASIC: CHR$(13);

If the CR CODE option menu is set for CR=CR, the characters following the CR are printed over the previous characters on the line. If identical characters are placed in the same position on the line, those characters are printed in double strike print when the Overstrike mode is enabled from the control panel.

The CR=CR configuration causes subsequent printable data to overprint previous data at half speed if Overstrike is enabled from the control panel (and prints somewhat faster if Overstrike is disabled), unless an intervening paper motion command is received.

If the CR CODE is configured for:

CR=CR+LF

Control code CR is converted to perform a carriage return and line feed function.

Form Feed

Form Feed <FF>: Prints the data in the buffer, advances the paper position to the next top-of-form and moves the character position to the first character column. The FF code cancels all single-line only print attributes.

Format

<FF>

Decimal: 12
Hex: 0CH
BASIC: CHR$(12);

Indeterminate Conditions

Forms length can be modified by using the control panel or forms length control codes.

The Form Feed command may reacts differently if a VFU is active (refer to VFU section).

Line Feed

Line Feed <LF>: Prints the data in the buffer (if any) and advances the vertical character position one line at the current line space setting and moves the logical print position to the left margin.

The LF function cancels all single line print attributes such as double high (elongated) and double wide (expanded) characters.

In the Even Dot Graphics Plot mode (high density graphics), the LF code does not cause paper position motion; the data in the buffer is plotted and the logical print position is set at character column 1 in anticipation of the Odd Dot Plot control code to complete high density graphic plotting. In the Odd Dot Graphics Plot mode (normal density graphics), the LF code plots the data in the buffer, advances the paper position a single dot row at the current vertical dot density, and positions the logical print position at character column 1.

Format

<LF>

Decimal: 12
Hex: 0AH
BASIC: CHR$(12);

CHARACTER SETS, FONT HANDLING AND ENHANCEMENTS

Character Set Select

Selects the character set, extended character set, and the international language for a specific character set.

Format

<SFCC> l xyz

x: character set
y: international language for the selected character set table
z: extended character set for the selected character set

Decimal: <SFCC> 108 x y z
Hex: <SFCC> 6C xH yH zH
BASIC: CHR$(<SFCC>);CHR$(108);"xyz";

Character Set Select (x)

(x)	Character Set
0(30)	Code Page 437
1(31)	Code Page 8859-1
2(32)	Invalid (Defaults to Code Page 437)
3(33)	Code Page 8574
(2A)	Unchanged

International Language Select (y)

y	x 0(30) CP 437	1(31) CP 8859-1	2(32)	3(33) CP 8574
0(30)	ASCII (USA)	ASCII (USA)	NA	ASCII (USA)
1(31)	French	EBCDIC	NA	French
2(32)	German		NA	German
3(33)	English		NA	English
4(34)	Danish		NA	Norw/Danish
5(35)	Swedish		NA	Swedish
6(36)	Italian		NA	Italian
7(37)	Spanish		NA	Spanish
8(38)	Japanese		NA	Japanese
9(39)	Fr. Canadian		NA	Fr. Canadian
10(3A)	Latin Amer		NA	Dutch
11(3B)	Norwegian		NA	Finnish
12(3C)	Danish II		NA	Swiss
13(3D)	Spanish II		NA	
14(3E)	Latin AM II		NA	

Character Set Select **(continued)**

Extended Character Set Select (*z*)

z	x 0(30) IBM PC	1(31)	2(32)	3(33)
0(30)	CP 850[1]	NA	NA	NA
1(31)				
2(32)				
3(33)				
4(34)				
5(35)				
6(36)				
7(37)				
8(38)				
9(39)				
10(3A)				
11(3B)				
12(3C)				

[1]Valid only if x = 0. All other values of z are ignored including '*'

Indeterminate conditions

If the (*) character is the value selected for x, the character set does not change. If (*) or (X) is selected for y, the previously selected international language is used.

Notes

This command implementation is different than the target printer due to limitations in Font character sets. Refer to the "Emulation Differences" section of this document.

Select International Character Set

Selects the international character using the parameter (where the parameter is one of the values in the table below).The ultimate character set selected is a function of the parameter and the currently-active code page.

Format

<SFCC> P S E T ; n or <SFCC> R n

Decimal: <SFCC> 80 83 69 84 59 n
Hex: <SFCC> 50 53 45 54 3B nH
BASIC: CHR$(<SFCC>);"PSET;";CHR$(n);

International Character Set

n	Character Set Select		
PSET	CP 437	CP 8859-1	CP 8574
0	ASCII (USA)	ASCII (USA)	ASCII (USA)
1	French	EBCDIC	French
2	German		German
3	English		English
4	Danish		Nor./Danish
5	Swedish		Swedish
6	Italian		Italian
7	Spanish		Spanish
8	Japanese		Japanese
9	F. Canadian		F. Canadian
10	Latin Am.		Dutch
11	Finnish		Finnish
12	Swiss		Swiss

Indeterminate Conditions

Selecting SFCC RX accesses the substitution table for the current character set.

Notes

This command implementation is different than the target printer due to limitations in Font character sets. Refer to the "Emulation Differences" section of this chapter.

Bold Print ON

Selects Bold Print mode. All characters are printed twice using direct overprint (striking each dot twice) until reset by the Bold Print off code or a printer reset. When SFCC j is used, Bold Print printing is selected for one line only; it is reset by the Bold Print off control code, emulation reset, or a paper motion command.

Format

<SFCC> G

Decimal: <SFCC> 71
Hex : <SFCC> 47
BASIC: CHR$(<SFCC>);"G"

Bold Print OFF

Deselects Bold Print mode.

Format

<SFCC> H

Decimal: <SFCC> 72
Hex: <SFCC> 48
BASIC: CHR$(<SFCC>);"H";

Indeterminate Conditions

This sequence resets Bold Print printing only. Other attributes (double wide, etc) remain active.

Single Line Double High

Selects elongated (double high) character printing for one line only. Elongated characters are approximately double height but standard width. The elongated character control code is a line-by-line print attribute; when the control code is received, one entire line of elongated characters is printed and then automatically reset at the end of the line.

Format

<SFCC> h Primary command format

<BS> Selects Double High when the Double High print option is selected from the control panel.

Decimal: <SFCC> 104 or 8
Hex : <SFCC> 68 or 08H
BASIC: CHR$(<SFCC>);"h"; or CHR$(8);

Indeterminate Conditions

When configured for double high print from the control panel menu, the control code BS (Hex 08) also selects elongated character printing for a single line.

Emphasized Print ON

Selects Emphasized Print mode. Emphasized print, also called "shadow" printing, consists of printing each letter twice, the second printing horizontally offset (1/240th inch) from the first. Emphasized print is turned off by the emphasized print reset control code or emulation reset.

Format

<SFCC> E

Decimal: <SFCC> 69
Hex: <SFCC> 45
BASIC: CHR$(<SFCC>);"E";

Indeterminate Conditions

Emphasized print is ignored during superscript or subscript printing, and when 15-20 cpi characters are selected.

Emphasized Print OFF

Deselects Emphasized Character print mode.

Format

<SFCC> F

Decimal: <SFCC> 70
Hex: <SFCC> 46
BASIC: CHR$(<SFCC>);"F";

Indeterminate Conditions

This sequence resets Emphasized printing only. Other attributes (bold, double wide, etc) remain active.

Double Wide Print

Double Wide Print (continuous): Selects or resets expanded (double wide) print.

Format

<SFCC> W n)

Decimal: <SFCC> 87 n
Hex: <SFCC> 57 nH
BASIC: CHR$(<SFCC>);n

n = 1 selects expanded print (hex 01 or hex 31)
n = 0 resets expanded print (hex 00 or hex 30)

When expanded print using SFCC W is received, all characters print double wide until reset by the expanded print reset control code, printer reset.

Single Line Double Wide Print

Double Wide Print (single line): Selects expanded (double wide) print for one line only. This expanded print control code is a line-by-line print attribute. When the SFCC k control code is received, the current line is printed double wide and then automatically reset at the end of the line.

Format

<SFCC> k

Decimal: <SFCC> 107
Hex: <SFCC> 6B
BASIC: CHR$(<SFCC>);"k";

This control code can be reset by a paper motion control code (LF, VT, CR, etc.), SFCC @ (printer reset), CAN or SFCC W (double wide print).

Extended Character Set Select

Extended Character Set Access: Accesses the extended character set in the range ADH to FFH hex using codes 20H to 7FH. Used in 7-bit systems as if data bit 8 was set to 1. For example, sending code 20 hex accesses the symbol at code point A0H. If a printable symbol is not available at the code point, a space is printed.

Format

<SO> or <SFCC> <parameter>

<SO>
<SFCC> <SO>
<SFCC> n
<SFCC> 4

Decimal:
14
<SFCC> 14
<SFCC> 110
<SFCC> 4

Hex:
0EH
<SFCC> 0E
<SFCC> 6E
<SFCC> 34

BASIC:
CHR$(14);
CHR$(<SFCC>);CHR$(14);
CHR$(<SFCC>);"n";
CHR$(<SFCC>);"4";

Indeterminate Conditions

<SFCC> 4 is not canceled by the next paper motion command; 0E, <SFCC> 0E, <SFCC> 6E are canceled by paper motion.

Extended Character Set Cancel

Extended Character Set Cancel: Cancels the extended character set as selected by SO, SFCC SO, SFCC n, SFCC 4, and selects the primary Character Set.

Used in 7-bit systems as if data bit 8 was set to 1. For example, sending code 20 hex accesses the symbol at code point 0A0H hex. If a printable symbol is not available at the code point, a space is printed.

Format

<SI> or <SFCC> <parameter>

<SI>
<SFCC> <SI>
<SFCC> o
<SFCC> 5

Decimal:	15 <SFCC> 15 <SFCC> 111 <SFCC> 5
Hex:	0FH <SFCC> 0FH <SFCC> 6FH <SFCC> 35H
BASIC:	CHR$(15); CHR$(<SFCC>);CHR$(15); CHR$(<SFCC>);CHR$(111); CHR$(<SFCC>);CHR$(5);

Font Select

Font Selection: Selects a font (DP, NLQ, or OCR) and character pitch in characters per inch (cpi).

Format

<SFCC> X <m> <n> or
<SFCC> P M O D E ; n

Decimal: <SFCC> 88 <m> <n>
<SFCC> 80 77 79 68 69 3B <n>
Hex: <SFCC> 58 (parm 1, parm 2)
<SFCC> 50 4D 4F 44 45 3B <nH>
BASIC: CHR$(<SFCC>);"X";CHR$(<m>);CHR$(<n>);
CHR$(<SFCC>);"PMODE;<n>";

<SFCC> X <m> <n> Format

m = font code
n = pitch code (cpi)

m (hex)	0(30)	1(31)	2(32)	3(33)	4(34)	5(35)	6(36)
FONT	DP	NLQ	DP	DP	DP	OCR-A	OCR-B
n (hex)	Characters Per Inch						
0(30)	10	10	10	10	10	10	10
1(31)	12	12	12	12	12	-	-
2(32)	13.3	13.3	13.3	13.3	13.3	-	-
3(33)	15	15	15	15	15	-	-
4(34)	17.1	17.1	17.1	17.1	17.1	-	-

<SFCC> PMODE;n Format

n ranges from 0 to 6 to select the font and pitch combination. All other values are invalid.

n = pitch code (cpi)

An asterisk (*) (hex 2A) may be substituted for m or n. Whenever the asterisk replaces m or n, its current value does not change. Values other than those shown in the table below are ignored.

PMODE switches to the Primary Character Set and selects font and pitch according to the following table.

'n'	Font and Pitch
0	Data Processing 10 CPI
1	Data Processing 12 CPI
2	Data Processing 15 CPI
3	NLQ 10 CPI
4	Data Processing 10 CPI
5	OCR-A 10 CPI
6	OCR-B 10 CPI

Notes

This command implementation is different than the target printer due to limitations in Font character sets. Refer to the "Emulation Differences" section of this chapter.

Overscoring

Overscoring: Enables or disables automatic overscoring of all characters.

Format

<SFCC> _ <n>

Decimal: <SFCC> 95 <n>
Hex: <SFCC> 5F <nH>
BASIC: CHR$(<SFCC>);"_<n>";

n = 0 disables automatic overscoring (hex 00 or hex 30)

n = 1 enables automatic overscoring (hex 01 or hex 31)

When automatic overscore is enabled, all characters, including spaces, are overscored until the feature is disabled.

Super/Subscript

Superscript or Subscript: Selects superscript or subscript printing.

Format

<SFCC> S <n>

Decimal: <SFCC> 83 <n>
Hex: <SFCC> 53 <nH>
BASIC: CHR$(<SFCC>);"S<n>";

n = 0 enables superscript printing (hex 00 or hex 30)
n = 1 enables subscript printing (hex 01 or hex 31)

Details

When the super/subscript control code is received, all characters print as superscript or subscript until reset by the super/subscript reset control code or printer reset. Emphasized print is ignored if super/subscript printing is active.

When the BS feature is enabled from the control panel menu, both superscript and subscript characters can be printed in the same character column using the Backspace (BS) control code.

Indeterminate Conditions

Overlapping lines may occur when combining Superscript or Subscript printing with other print attributes such as Double High or with small line spacing.

Super/Subscript Reset

Superscript or Subscript Reset: Deselects superscript or subscript printing.

Format

<SFCC> T

Decimal: <SFCC> 84
Hex: <SFCC> 54
BASIC: CHR$(<SFCC>);"T";

Underline

Character Underlining: Enables or disables automatic underlining of all characters.

Format

<SFCC> - <n>

Decimal:	<SFCC> 45 <n>
Hex:	<SFCC> 2D <nH>
BASIC:	<CHR$(<SFCC>);"-<n>";

n = 0	disables automatic underlining (hex 00 or hex 30)
n = 1	enables automatic underlining (hex 01 or hex 31)

Details

When automatic underline is enabled, all characters, including spaces, are underlined until the feature is disabled.

HOUSEKEEPING COMMANDS

Print Control Codes

Forces the hex codes 80H to 9FH to become printable symbols in the currently selected character set. Cancels the executable control code operation activated by the SFCC 7.

Format

<SFCC> 6

Decimal: <SFCC> 6
Hex : <SFCC> 36
BASIC: CHR$(<SFCC>);"6";

Indeterminate Conditions

This feature can also be selected from the control panel.

Execute Control Codes

Forces the hex codes 80H to 9FH to execute as control codes. Cancels the printable control code operation activated by the SFCC 6.

Format

<SFCC> 7

Decimal: <SFCC> 7
Hex: <SFCC> 37
BASIC: CHR$(<SFCC>);"7";

Indeterminate Conditions

This feature is also selectable by control panel operations.

Emulation Reset

Initializes all printing parameters to values previously saved. When reset to the previously saved values, the current line is set to the top-of-form position. Font, line spacing, international language selection, margins, form length, skip-over perforation, and character pitch are reset to previously saved values. Character-by-character and line-by-line attributes are canceled. The vertical format unit is cleared.

Format

<SFCC> @

Decimal: <SFCC> 64
Hex : <SFCC> 40
BASIC: CHR$(<SFCC>);"@";

Set Forms Length In Inches

Set Form Length (Inches)

Format

<SFCC> I N C H E S ; <n> ; <f>

Decimal: <SFCC> 73 77 67 72 69 83 59 <n> 59 <f>
Hex : <SFCC> 49 4E 43 48 45 53 3B <nH> 3B <fH>
BASIC: CHR$(<SFCC>):"INCHES<n>;<f>";

n = a whole number from 1 to 22 specifying the number of inches on a page.

f = a fractional number in 0.5 inch increments (minimum forms length is 0.5 inches).

Details

When this command is received, the current position becomes the first line of the form and the form length value becomes the new form length. Vertical tab positions set below the bottom of the form are cleared.

NOTE
Form length is defined in inches, therefore subsequent line spacing changes do not affect the results of this command.

Indeterminate Conditions

Form length can also be set from the control panel menu. If a VFU is enabled and loaded, this command is ignored.

Set Form Length In Lines

The form length is set to the number of lines defined by the quotient of n and the current line spacing so that the units are in inches.

Form length can also be set from the control panel menu.

Format

<SFCC> L I N E S ; <n>

Decimal: <SFCC> 76 73 78 69 83 59 <n>
Hex : <SFCC> 4C 49 4E 45 53 3B <nH>
BASIC: CHR$(<SFCC>);"LINES;<n>";

n = 1 to 192 to specify the number of lines per page at the current spacing.

Indeterminate Conditions

If a VFU is enabled and loaded, this command is ignored.

Set Line Spacing (1/6 Inch)

Sets line spacing to 6 lpi or as set by SFCC A.

Formats

<SFCC> L P I ; n or

<SFCC> A n followed by
<SFCC> 2

Details

Using the SFCC LPI ; n command, the value of n can be 6 or 8 only. If n = 6, this command sets line spacing to 1/6 inch. Values of n other than 6 or 8 are ignored.

The SFCC command stores a line spacing value in 1/72 inch to be activated by the SFCC 2 sequence. The default value for this stored value is 6 LPI (12/72).

SFCC 2 asserts n/72-inch line spacing as set by SFCC A. If no distance has been set by SFCC A, the distance is 1/6 inch.

Decimal:	<SFCC> 76 80 73 59 <n>	or
	<SFCC> 65 <n> <SFCC> 2	followed by
Hex:	<SFCC> 4C 50 49 59 <nH>	or
	<SFCC> 41 <nH> <SFCC> 2	followed by
BASIC:	CHR$(<SFCC>);"LPI;<n>";	or
	CHR$(<SFCC>);"A<n>"; CHR$(<SFCC>);"2";	followed by

Set Line Spacing (1/8 Inch)

There are two formats for this command.

The SFCC 0 command specifies continuous line spacing at 1/8-inch increments (8 lpi).

In the SFCC LPI ; n command, the value of n can be 6 or 8 only. If n = 8, this command sets line spacing to 1/8 inch. Values of n other than 6 or 8 are ignored.

Formats

<SFCC> 0 or
<SFCC> L P I ; <n>

Decimal: <SFCC> 0 or
<SFCC> 76 80 73 59 <n>

Hex: <SFCC> 30 or
<SFCC> 4C 50 49 3B <nH>

BASIC: CHR$(<SFCC>);"0"; or
CHR$(<SFCC>);"LPI;<n>";

Details

When the 1/8-inch line spacing control code is received, all lines print at 8 lpi until a new line spacing is selected or power is reset. The control code line spacing selection overrides the control panel line spacing setting.

Single Line Spacing

Selects line spacing of 8 or 10.3 lpi for the current line only.

Formats

<ACK> or
<SFCC> f

Decimal: 6 or
<SFCC> 102

Hex: 06 or
<SFCC> 66

BASIC: CHR$(6); or
CHR$(<SFCC>);CHR$(6);

Details

The default line spacing is reselected automatically after the current line terminates.

If the alternate line spacing selected from the control panel is 8 lpi, the ACK control code sets the line spacing to 8 lpi. If 10.3 lpi was selected from the control panel, the ACK control code sets the line spacing to 10.3 lpi (7/72 inch).

Set Line Spacing 7/72 Inch

Specifies the line spacing at 7/72-inch (10.3 lpi) increments.

Format

<SFCC> 1

Decimal:	<SFCC> 1
Hex:	<SFCC> 31
BASIC:	CHR$(<SFCC>);"1";

Details

When the 7/72-inch line spacing control code is received, all lines print at the 7/72-inch line spacing until a new line spacing is selected or power is reset.

Indeterminate Conditions

Overlapping lines may occur when combining this control code with other print attributes such as Elongated (Double High), Superscript, or Subscript;

Set Line Spacing n/72 Inch

Stores a line spacing of n/72-inch increments.

Format

<SFCC> A <n> followed by
<SFCC> 2

Decimal:	<SFCC> 65 <n> <SFCC> 2	followed by
Hex:	<SFCC> 41 <nH> <SFCC> 2	followed by
BASIC:	CHR$(<SFCC>);"A<n>"; CHR$(<SFCC>);"2";	followed by

n = 1 to 24 (all others are ignored)

Details

When the SFCC A control sequence is received, all line feed commands following an SFCC 2 sequences are at n/72-inch line spacing until a new line spacing is selected or power is reset.

The SFCC 2 sequence asserts the line spacing that was stored by the preceding SFCC A sequence.

Indeterminate Conditions

Small values of n may result in overlapping lines. Overlapping lines may also occur if print attributes such as Elongated (Double High), Superscript, or Subscript characters are used on the same line. Printing at different horizontal and vertical densities will not overlap.

Set Line Spacing n/216 Inch

Specifies the line spacing at n/216 inch increments.

Format

<SFCC> 3 <n>

Decimal: <SFCC> 3 <n>
Hex: <SFCC> 33 <nH>
BASIC: CHR$(<SFCC>);"3<n>"

n = 1 to 255

When the n/216 inch line spacing control code is received, all line feeds following are at n/216 inch line spacing until a new line spacing is selected or power is reset.

The vertical character position moves only in multiples of the current dot row spacing. If the distance to move is other than a multiple of the current dot row spacing, the remainder is added to the next paper motion command.

Indeterminate Conditions

Caution should be used when combining this control code with other print attributes such as Elongated (Double High), Superscript, or Subscript; overlapping lines may occur.

Vertical Tab **Vertical Tab <VT>:** Prints the data in the buffer and advances the paper to the next vertical tab position.

Format

<VT>

Decimal: 11
Hex: 0B
BASIC: CHR$(11);

Details

If a vertical tab format is defined in the EVFU (channel 12) and the VFU is enabled, the paper is moved to the next vertical tab position. If a vertical tab format is not defined, the paper is advanced to the next line at the current line spacing.

PLOT MODE GRAPHICS OPERATIONAL DESCRIPTION

Plot Density

Plot density refers to the number of dots per inch (dpi) printed in a single dot row. Two types of plot density are available in this emulation:

- Normal density plot mode
- Double density plot mode

Normal Density Plot Mode

- Selected using the *odd* dot plot control code ENQ (05 hex) or the "SFCC e" control sequence.
- The odd-numbered dot columns (120 DPI grid) are addressed to produce a horizontal density of 60 DPI.

Double Density Plot Mode

- Selected using the *even* dot plot control code EOT (04 hex), or the "<SFCC> d" control sequence. The even dot mode must be used in conjunction with the odd dot plot control code ENQ (05 hex) or "<SFCC> e" sequence.
- The even dots are sent first, followed by the odd dots, allowing a maximum of 1632 dots in a single dot row at 120 dpi (13.6 inch line).
- The vertical density remains the same as in normal density plotting.

Plot Mode Format

- Each data byte specifies six possible dot columns.
- Using odd dot plot, bits 1 to 6 of the data byte address the odd-numbered dot columns; using even dot plot, bits 1 to 6 of the data byte address the even-numbered dot columns.
- Bit 6 and/or bit 7 of the data byte must be a 1 (true) bit in the Plot mode.
- Bit 8 of the data byte is ignored in Plot Mode; it can be either 1 or 0.
- The binary equivalent of the plot data bytes must be known in order to accurately address specific dot positions.

Plot Data Line Format

1. The plot mode control code: either 05 hex (or “SFCC e”) for normal density, or 04 hex (or “SFCC d”) combined with 05 hex for double density plotting.
2. The data bytes to be plotted.
3. The line terminator 0A hex or 0C hex.

With print width set to 13.6 inches, a plot data line may contain any number of bytes up to a maximum of 136 for horizontal dot density of 60 dpi or 272 bytes for a horizontal density of 120 dpi.

A plot data line may contain any number of data bytes up to the maximum. If automatic line feed is disabled from the control panel menu, any bytes over the maximum are lost (graphic character will not wrap at the right margin). If the maximum is exceeded and automatic line feed is enabled, a line feed (LF) is forced and the remaining plot data are printed as text on the next line (graphic characters will wrap in this case).

The plot mode command may occur anywhere in the line, but plot speed may decrease if it is not at the beginning of the line.

Normal Density Plot Mode Format

1. Send the plot command code ENQ (05 hex) or the control sequence “SFCC e”.
2. Send the plot data.
3. End with a line terminator, either a LF (0A hex) or a FF (0C hex). A CR (if CR = CR + LF has been configured from the control panel menu) may also be used instead of the LF code.
4. A line feed (0A hex) used as the line terminator causes the contents of the buffer to be plotted and the paper advances a single dot row at the vertical density of the current mode.
5. A form feed (0C) hex used as the line terminator causes the contents of the buffer to be plotted and the paper to advance to the top of the next form.

Double Density Plot Mode Format

1. Send the even dot plot control code EOT (04 hex) or control sequence “SFCC d”, followed by a line of data.
2. Send a line terminator, which causes the printer to plot the contents of the buffer. The paper does *not* advance in double density plot; the printer now waits for the second line of data.
3. Send the odd dot plot control code ENQ (05 hex) or control sequence “SFCC e” and a second line of data, followed by a line terminator.
   - A line feed (0A hex) used as the line terminator causes the contents of the buffer to be plotted and the paper advances a *single dot row,* based on the vertical density of the current mode. A CR (if CR = CR + LF is configured) may also be used with the same result.
   - A form feed (0C) hex used as the line terminator causes the contents of the buffer to be plotted and the paper to advance to the top of the next form.

Plot Mode Graphic Character Chart

Char	Hex Value	Dots
space	20	oooooox
!	21	xooooox
“	22	oxoooox
#	23	xxoooox
$	24	ooxoox
%	25	xoxoox
&	26	oxxoox
`	27	xxxoox
(	28	oooxox
)	29	xooxox
*	2A	oxoxox
+	2B	xxoxox
,	2C	ooxxox
-	2D	xoxxox
.	2E	oxxxox
/	2F	xxxxox
0	30	oooxxx
1	31	xoooxx
2	32	oxooxx
3	33	xxooxx
4	34	ooxoxx
5	35	xoxoxx
6	36	oxxoxx
7	37	xxxoxx
8	38	oooxxx
9	39	xooxxx
:	3A	oxoxxx
;	3B	xxoxxx
<	3C	ooxxxx
=	3D	xoxxxx
>	3E	oxxxxx
?	3F	xxxxxx

Char	Hex Value	Dots
@	40	oooooo
A	41	xooooo
B	42	oxoooo
C	43	xxoooo
D	44	ooxooo
E	45	xoxooo
F	46	oxxooo
G	47	xxxooo
H	48	oooxoo
I	49	xooxoo
J	4A	oxoxoo
K	4B	xxoxoo
L	4C	ooxxoo
M	4D	xoxxoo
N	4E	oxxxoo
O	4F	xxxxoo
P	50	ooooxo
Q	51	xoooxo
R	52	oxooxo
S	53	xxooxo
T	54	ooxoxo
U	55	xoxoxo
V	56	oxxoxo
W	57	xxxoxo
X	58	oooxxo
Y	59	xooxxo
Z	5A	oxoxxo
[	5B	xxoxxo
\	5C	ooxxxo
]	5D	xoxxxo
^	5E	oxxxxo
_	5F	xxxxxo

Char	Hex Value	Dots
`	60	ooooox
a	61	xoooox
b	62	oxooox
c	63	xxooox
d	64	ooxoox
e	65	xoxoox
f	66	oxxoox
g	67	xxxoox
h	68	oooxox
i	69	xooxox
j	6A	oxoxox
k	6B	xxoxox
l	6C	ooxxox
m	6D	xoxxox
n	6E	oxxxox
o	6F	xxxxox
p	70	oooxxx
q	71	xoooxx
r	72	oxooxx
s	73	xxooxx
t	74	ooxoxx
u	75	xoxoxx
v	76	oxxoxx
w	77	xxxoxx
x	78	oooxxx
y	79	xooxxx
z	7A	oxoxxx
{	7B	xxoxxx
|	7C	ooxxxx
}	7D	xoxxxx
~	7E	oxxxxx
Del	7F	xxxxxx

x = dot o = no dot

Exiting Plot Mode Graphics

When returning to a text line from a plot mode line, put an extra line feed in the data stream to maintain proper line registration throughout the page. This will allow the text characters to be put back on grid.

PLOT MODE GRAPHICS DENSITY COMMANDS

High Horizontal Density Graphics

Prints dots at the even numbered dot columns.

Formats

<EOT> or
<SFCC> d

Decimal: <EOT> or
<SFCC> 100

Hex : 04 or
<SFCC> 64

BASIC: CHR$(<SFCC>);"d";

The even dot plot code is used for programming high density graphics and must be used in conjunction with the Odd Dot Plot code (05 hex). Refer to the Graphics section for detailed plot mode information.

High Vertical Density Graphics

Modifies the paper motion for a plot mode line to 1/144 inch rather than 1/72 inch. The ENQ (plot mode code) should precede the DLE. See the discussion in the section on dot graphics for more information. When not preceded by a plot mode code, DLE acts as a VFU channel command.

Format

<DLE>

Decimal: 16
Hex: 10
BASIC: CHR$(10);

Notes

GENICOM private code (not part of the target printers control codes).

Single Line, High Horizontal Density

(Genicom Private Command): Used in forming a line of plot mode graphics, this code specifies a single line of data to be plotted at a dot horizontal density of 120 DPI. The EOT (plot mode code) should precede the NAK. See the discussion in this chapter on dot graphics for more information.

When not preceded by a plot mode code, NAK acts as a VFU channel command.

Format

<NAK>

Decimal: 21
Hex : 15
BASIC: CHR$(21);

Notes

GENICOM private code (not part of the target printer's control codes).

Normal Density Graphics

Prints dots at the odd numbered dot columns.

Format

<ENQ>

Decimal: 5
Hex: 05
BASIC: CHR$(5);

Details

This is the normal density graphics control code. The ENQ code should occur before any printable data in the data stream.

Notes

Refer to the Graphics section for more details on Plot Mode Graphics.

High Density Graphics

For high density graphics, the Even Dot Plot code (04 hex) must be used in conjunction with (and precede) the Odd Dot Plot code in the line.

Format

<SFCC> e

Decimal: <SFCC> 101
Hex : <SFCC> 65
BASIC: CHR$(<SFCC>);"e"

Notes

Refer to the Graphics section for more details on Plot Mode Graphics.

DIFFERENCES FROM TARGET PRINTER EMULATION

Discarded Commands

The following commands from the target printer are parsed by the current P-Series emulation and then discarded:

Select Extended Character Set (SFCC OSET;n)

The fonts required for this command were not available on the P-Series.

Sequence discarded.

Download a Language (SFCC V)

The complete sequence SFCC V {QQQ} E {AAA} E {SSSSS} E (data) is parsed and discarded and the number of characters specified by the parameters as download data are also discarded.

Download a Character Shape (SFCC c)

The complete sequence SFCC c{PP} {SSSSSE} {A} (data) is parsed and discarded and the number of characters specified by the parameters as download data are also discarded.

Postnet Bar codes (SFCC |p*xxxxx-yyyy-zz*)

Sequence discarded.

Ribbon Minder Enable/Disable (SFCC r E/SFCC r D)

Sequence discarded.

NOTE
"Ribbon Minder" is a trade mark of Printronix, Inc.

Ribbon Minder Set Job Rate (SFCC r J nnnn E)

Sequence discarded.

Ribbon Minder Worn Message (SFCC r A n)

Sequence discarded.

COMMAND LINE DEBUG

The Genicom P-Series emulation does not contain the command line debugger function for detecting and displaying error in Command Line Sequences.

FONT STYLES, PITCHES, AND CHARACTER SETS

Font Styles

The emulation uses the DP font instead of the three (3) High Speed fonts.

Font Pitches

Quality	Emulation	Target
DP	60 x 72	120 x 72
High Speed	60 x 72	120 x 48
NLQ	120 x 144	180 x 96
OCR	120 x 144	120 x 144

Character Sets

Set No.	Emulation	Target
0	CP 437	IBM PC
1	CP 8859-1	Multinational
2	None (discarded)	ECMA 94
3	CP 8574	DEC Multinational
4	None (discarded)	N/A

Extended Character Sets

The emulation supports code page 850 only.

Form Length

Maximum form length of the 5000 series is 22 inches. All commands which set forms length in Inches, Lines, or lines by VFU use 22 inches instead of the target printers 24 inch limit.

Plot Mode Graphic Densities

The target printer defaults the graphic density to certain values based on the font selection:

- DP: 60 dpi horizontally, 72 dpi vertically
- NLQ: 90 dpi horizontally, 96 dpi vertically
- HS: 60 dpi horizontally, 48 dpi vertically

The 5000 series printers support 60/120 dpi horizontally and 72/144 dpi vertically.

Enhancements

The following enhancements were made to the emulation. These features do not exist as part of the target printer.

High Vertical Density Plot Mode Graphics

A <DLE> code in a graphics line will cause the next graphic line feed to be 1/144 inch instead of 1/72 inch.

CHAPTER 5. PROPRINTER EMULATION

INTRODUCTION

The IBM Proprinter III XL emulation Is selected through the control panel. Printer option straps Proprinter Table (Appendix D) replace the applicable switches used on a Proprinter.

Although every effort has been made to make this printer functionally similar to the Proprinter, some differences do exist.

DIFFERENCES FROM PROPRINTER

- Non-Proprinter fonts are available; however, proportional spacing line lengths may be different.
- Download fonts are not available.
- The Proprinter 20 cpi font is not available.
- Bidirectional and unidirectional printing do not apply on this printer.
- Double-width and double-height characters are slightly different.
- 240 dpi graphics are printed on a 120 dpi grid. Adjacent dots are OR'ed together. The aspect ratio of this printer (height vs. width of a graphic image) is identical to the Proprinter.

PROPRINTER CONTROL CODES

BEL **Bell:** Sounds a momentary audible tone.

Decimal: 7
Hex: 07
BASIC: CHR$(7);

BS **Backspace:** Moves the print position one character to the left. This code is normally used for overstriking a character. When the print position is at the left margin, a received BS has no effect.

Decimal: 8
Hex: 08
BASIC: CHR$(8);

CAN **Cancel:** Causes all printable data received since the last line terminator to be deleted. Print modes enabled since the last terminator (other than double-width printing initiated by the SO code) stay in effect. Example: If underlining was enabled during the line, it will still be active for the next line received. The cancel control code does not change the current print position.

Decimal: 24
Hex: 18
BASIC: CHR$(24);

CR **Carriage Return:** CR moves the current print position to the left margin. If auto LF on CR is set, either by Emulation Settings menu option or by command (ESC 5), then a line feed will also be executed.

Decimal: 13
Hex: 0D
BASIC: CHR$(13);

DC1 **Device Code 1:** Select printer (parallel interface only). DC1 sets the printer online after being deselected by an ESC Q.

Decimal: 17
Hex: 11
BASIC: CHR$(17);

DC2 **Device Code 2:** Sets 10 cpi printing. DC2 sets the printer to 10 cpi (5 cpi if double-wide is enabled). It cancels condensed printing mode and 12 cpi printing.

Decimal: 18
Hex: 12
BASIC: CHR$(18);

DC3 **Device Code 3:** Deselect printer. When using a serial interface, DC3 (XOFF) is sent to the host to indicate the printer is not ready to accept data. When using a parallel interface, a received DC3 is treated as a NUL.

Decimal: 19
Hex: 13
BASIC: CHR$(19);

DC4 **Device Code 4:** Cancel double-wide printing by line. DC4 cancels one-line double-wide print set by an SO code. It does not cancel continuous double-wide printing set by ESC W 1.

Decimal: 20
Hex: 14
BASIC: CHR$(20);

ESC **Escape:** Introduces an escape sequence. ESC tells the printer that the following characters are to be interpreted as a printer command, not printable data. See the section on Proprinter escape sequences.

Decimal: 27
Hex: 1B
BASIC: CHR$(27);

FF **Form Feed:** Advances the paper to the next top of form with the print position at the left. If a top margin is set, paper advances to the first print line below the margin.

Decimal: 12
Hex: 0C
BASIC: CHR$(12);

HT **Horizontal Tab:** Advances the print position to the next horizontal tab stop. If there are no tab stops between the print position and the right margin, the HT is ignored. Tab stops are set by the command ESC D. Default tabs are set every eight columns, beginning at column 9.

Decimal: 9
Hex: 09
BASIC: CHR$(9);

LF **Line Feed:** Advances the paper one line by the current setting for line space. If the LF causes paper to exceed the form length, a form feed occurs. Acts as a line terminator.

Decimal: 10
Hex: 0A
BASIC: CHR$(10);

NUL **Null:** NUL is ignored by the printer when received by itself. If received as part of a graphics data sequence, it is interpreted as a graphics space. Null is used by some escape sequences to end a series of parameters. When used as a parameter of a sequence looking for an even or odd value, it is considered even. Example: ESC S NULL causes superscripting to occur.

Decimal: 0
Hex: 00
BASIC: CHR$(O);

SI **Shift In:** SI causes condensed printing. It sets the printer to 17.1 cpi (8.55 cpi if double-wide printing is enabled). Condensed printing remains in effect for subsequent lines until cancelled.

Decimal: 15
Hex: 0F
BASIC: CHR$(15);

SO **Shift Out:** SO causes double-wide printing for the current line only.

Decimal: 14
Hex: 0E
BASIC: CHR$(14);

VT **Vertical Tab:** VT advances the paper to the next vertical tab setting and returns the print position to the left margin. A maximum of 64 vertical tabs is allowed per form. The vertical tabs are set using ESC B. The paper is advanced one line if no tab is set beyond the current line.

Decimal: 11
Hex: 0B
BASIC: CHR$(11);

COMMAND DIRECTORY

Sequence	Meaning	Page
ESC A n	Set text line spacing to n/72 inch	114
ESC B n1…n64 0	Set vertical tabs by line numbers	115
ESC C n	Set form length in lines	115
ESC C 0 m	Set form length in inches	115
ESC D n1…n28 0	Set horizontal tab stops in columns	115
ESC E	Start emphasized printing	115
ESC F	Cancel emphasized printing	115
ESC G	Select double-strike printing	115
ESC H	Cancel double-strike printing	116
ESC I n	Select print mode. 0 - DP. 2 NLQ	116
ESC J n	Graphics variable line spacing n/216 inch	114
ESC K n1 n2 v1…vn	Normal density graphics (60 DPI)	120
ESC L n1 n2 v1…vn	Dual density graphics low speed (120 DPI)	120
ESC N n	Skip perforation ON	116
ESC O	Skip perforation OFF	116
ESC P n	Proportional space mode	117
ESC Q n	Deselect printer	117
ESC R	Set all tabs to power on settings	117
ESC S n	Super/Sub script on	117
ESC T	Super/Sub script off	117
ESC U n	Unidirectional print on/off	117
ESC W n	Double-wide print on/off	118
ESC X n m	Set horizontal margins	118
ESC Y n1 n2 v1…vn	Dual density graphics (full speed)	120
ESC Z n1 n2 v1…vn	Quad density graphics (reduced speed)	121
ESC 0	Set 1/8 line spacing	113
ESC 1	Set 7/72 line spacing	113
ESC 2	Start text line spacing	113
ESC 3 n	Set graphics line spacing (n/216)	114
ESC 4	Set top of form	114
ESC 5 n	Automatic line feed on/off	114
ESC 6	Select character set 2	114
ESC 7	Select character set 1	114
ESC _ n	Continuous overscore on/off	112
ESC - n	Continuous underline on/off	112
ESC :	12 CPI printing	112
ESC ^	Print single character from chart	112
ESC n1 n2	Print continuously from chart	112
ESC [T n1 n2 m1.. m5	Select Code Page	113

ESCAPE SEQUENCES

ESC - n

Underscore: When underscoring is enabled, all printable characters and all space characters. including leading space characters. are underlined. Leading white space preceding a horizontal tab stop is not underlined. Not recommended for use with line draw characters.

n = 1, underscoring is enabled
n = 0, underscoring is disabled

Decimal: 27 45 <n>
Hex: 1B 2D <n>
BASIC: CHR$(27);CHR$(45);CHR$(<n>);

ESC _ n

Overscore: When overscoring is enabled. all printable characters and all space characters, including leading space characters, are overscored. Leading white space preceding a horizontal tab stop is not overscored. Not recommended for use with line draw characters.

n – 1 enabled
n – 0 disabled

Decimal: 27 95 <n>
Hex: 1B 5F <n>
BASIC: CHR$(27);"_<n>";

ESC \ n1 n2

Print Continuously from All Character Chart. Allows printing all the 256 characters and symbols (even those normally used as control codes) in the all character chart. The total number of characters to be printed from the all character chart is specified by n1 and n2 according to the formula: n1 + (256 * n2).

Example: To print 400 characters from the chart send CHR$(27);"\";CHR$(144);CHR$(1);

Decimal: 27 92 <n1> <n2>
Hex: 1B 5C <n1> <n2>
BASIC: CHR$(27);"\<n1><n2>";

ESC ^

Print Single Character from All Character Chart: The next character received is printed from the all character chart.

Decimal: 27 94
Hex: 1B 5E
BASIC: CHR$(27);"^";

ESC :

Set 12 cpi Printing: Sets the printer to 12 cpi (6 cpi if double-wide is enabled). DC2 resets to 10 cpi.

Decimal: 27 58
Hex: 1B 3A
BASIC: CHR$(27);":";

ESC [T n1 n2 ml m2 m3 m4 m5

Select Code Page: Selects international character sets. The default is IBM PC Multilingual Set 2.

n1: Always 5 (The number of m parameters used.)
n2: Always 0

ml, m2, and m5 are always zero.
m3 - See chart below.
m4 - See chart below.

m3 m4 International Character Set

7E 21 DEC Multinational
7F 21 Roman 8
8F 21 ISO 8859-1 Latin Alphabet #1
93 21 ISO 8859-5 Latin/Cyrillic
B5 01 IBM PC Set 2 USA (Microsoft Code Page 437)
52 03 IBM PC Multilingual Set 2 (MS Code Page 850)
54 03 Microsoft Code Page 852 (Slavic)
57 03 Microsoft Code Page 855 (Cyrillic)
5F 03 Microsoft Code Page 863 (French Canadian)

(The examples below show the m3 and m4 values for selecting Roman 8.)

Decimal: 27 91 84 5 0 0 0 127 33 0
Hex: 1B 5B 54 05 00 00 00 7F 21 00
BASIC: CHR$(27);"rr;CHR$(5);CHR$(O);CHRS(O);CHR$(O);
CHR$(127);CHR$(33);CHR$(0);

ESC 0

Set 8 Lines per Inch: Sets the line spacing to 1/8 of an inch (8 lpi).

Decimal: 27 48
Hex: 1B 30
BASIC: CHR$(27);"0";

ESC 1

Set 7/72 Lines per Inch Spacing: Sets the line spacing to 7/72 of an inch (10. 3 lpi)

Decimal: 27 49
Hex: 1B 31
BASIC: CHR$(27);"1";

ESC 2

Start Text Line Spacing: Activates the line spacing stored by the last ESC A, or sets 6 lpi if no ESC A command has been received.

Decimal: 27 50
Hex: 1B 32
BASIC: CHR$(27):"2";

ESC 3 n

Set Graphics Line Spacing: Sets the line spacing to n units of 1/216 inch. This allows for line spacing in .0046 inch increments to 1.18 inches (255/216). The value of n/216 is rounded up to the next 1/144 inch.

n = 1 through 255

Example: ESC 3 27 Sets the line spacing to 1/8 inch, or 27/216.

Decimal: 27 51 <n>
Hex: 1B 33 <n>
BASIC: CHR$(27);"3<n>";

ESC 4

Set Top of Form: Sets current paper position as top of form.

Decimal: 27 52
Hex: 1B 34
BASIC: CHR$(27);"4";

ESC 5 n

Automatic Line Feed: Printer automatically does a line feed after receiving a carriage return.

n = 0, disabled
n = 1, enabled

Decimal: 27 53 <n>
Hex: 1B 35 <n>
BASIC: CHR$(27);"5<n>";

ESC 6

Select Character Set 2: All characters (printable and control codes) received after this command are selected from character set 2. A reset, initialization, or ESC 7 resets to character set 1.

Decimal: 27 54
Hex: 1B 36
BASIC: CHR$(27);"6";

ESC 7

Select Character Set 1: All characters (printable and control codes) received after this command are selected from character set 1. Also, see ESC 6 above.

Decimal: 27 55
Hex: 1B 37
BASIC: CHR$(27):"7";

ESC A n

Stores n/72-inch Line Spacing: The text line spacing is stored, although not set for use, to the value n in units of 1/72 inch. An ESC 2 must be sent to start this line spacing. Valid parameter values are 1 through 85.

Decimal: 27 65 <n>
Hex: 1B 41 <n>
BASIC: CHR$(27);"A<n>";

ESC B n1 ... n64 0 **Set Vertical Tab Stops:** This sequence sets up to 64 vertical tabs by line number. The tabs must be in ascending order and the sequence must end with a NUL. ESC B NUL clears all tab stops. These tabs are stored as absolute values, so they are not affected by changes in lpi settings. This command resets any previously set tab stops.

Variable n represents values 1 through 254.

Decimal: 27 66 <nl>...<n64> 0
Hex: 1B 42 <n1>...<n64> 00
BASIC: CHR$(27);"B<nl>...<n64>";CHR$(0);

ESC C n **Set Form Length in Lines:** The value of n sets the form length in lines using the current line spacing setting. The maximum length is 22 inches (176 lines for 8 lpi, etc.). Top of form is set to the current form position. Once set, changing the line spacing has no effect on form length.

Decimal: 27 67 <n>
Hex: 1B 43 <n>
BASIC: CHR$(27);"C<n>";

ESC C 0 n **Set Form Length in Inches:** The value of n sets the form length from 1 to 22 inches. Top of form is set at the current vertical position. Once set, changing the line spacing has no effect on form length.

Decimal: 27 67 0 <n>
Hex: 1B 43 00 <n>
BASIC: CHR$(27);"C";CHR$(0);"<n>";

ESC D n1...n28 0 **Set Horizontal Tab Stops:** Sets horizontal tab stops at the positions specified "n" expressed in columns at the current cpi. Once set, changing the cpi has no effect on the tab positions. ESC D NUL clears all tab stops. Tab stops must be specified in ascending order. If more than 28 parameters are specified, the command is terminated.

Decimal: 27 68 <n1>...<n28> 0
Hex: 1B 44 <n1>...<n28> 0
BASIC: CHR$(27);"D<n1>...<n28>";CHR$(0);

ESC E **Start Emphasized Print**

Decimal: 27 69
Hex: 1B 45
BASIC: CHR$(27):"E";

ESC F **Stop Emphasized Print**

Decimal: 27 70
Hex: 1B 46
BASIC: CHR$(27);"F"';

ESC G **Start Double-Strike Print**

Decimal: 27 71
Hex: 1B 47
BASIC: CHR$(27);"G";

ESC H **Stop Double-Strike Print**

Decimal: 27 72
Hex: 1B 48
BASIC: CHR$(27);"H";

ESC I n **Select Print Mode**

n = 0 selects Draft Resident, USA
n = 1 selects Draft 12 CPI (Fast) Resident, USA
n = 2 selects NLQ Resident, USA
n = 3 selects NLQ H (Courier) Resident, USA
n = 4 selects Draft Download. Multi/USA
n = 5 selects Draft 12 CPI (Fast) Download, Multi/USA
n = 6 selects NLQ Download, Multi/USA
n = 7 selects NLQ H (Courier) Download, USA
n = 8 selects Draft Download. USA
n = 9 selects Draft 12 CPI (Fast) Download, USA
n = 10 selects NLQ Download, USA
n = 11 selects Alternate NLQ II Resident (Italic). USA
n = 12 selects Draft Download, Multi/USA
n = 13 selects 12 CPI Fast) Download, Multi/USA
n = 14 selects NLQ Download, Multi/USA
n = 15 selects Alternate NLQ 11 (Italic), Download, USA

Decimal: 27 73 <n>
Hex: 1B 49 <n>
BASIC: CHR$(27);"I<n>";

ESC J n **Variable Line Feed:** This command advances the paper a distance specified by the value of n in units of 1/216 inch. The value "n" can be a value from 0 to 255. The variable line feed is not stored, so there is no effect on line spacing values.

Decimal: 27 74 <n>
Hex: 1B 4A <n>
BASIC: CHR$(27);"J<n>";

ESC N n **Set Skip Perforation:** Sets the perforation skip distance to n lines. ESC N is reset when the form length is changed. Valid parameter values are 1 - 255. The printer converts the number of lines (n) to inches using the current line spacing and saves the skip distance in inches. The skip perforation distance does not change when the line spacing is changed. Also, in this chapter, see ESC 0.

Decimal: 27 78 <n>
Hex: 1B 4E <n>
BASIC: CHR$(27);"N<n>";

ESC 0 **Cancel Skip Perforation:** Resets the skip perforation value to zero lines.

Decimal: 27 79
Hex: 1B 4F
BASIC: CHR$(27);"O";

ESC P n **Select Proportional Spacing**

If n = odd number, proportional print enabled.
If n = even number, proportional print disabled.

Decimal: 27 80 <n>
Hex: 1B 50
BASIC: CHR$(27);"P<n>";

ESC Q n **Deselects IBM Proprinter (parallel interface only):** Stops printer from accepting data from the host. The host must reset the printer or select it using DC1. This sequence is intended for diagnostic purposes only. The variable (n) is 22.

Decimal: 27 81 22
Hex: 1B 51 16
BASIC: CHR$(27);"Q";CHR$(22);

ESC R **Set All Tabs to Power On Settings:** Sets horizontal tabs every eight positions starting at column 9 and clears all vertical tabs.

Decimal: 27 82
Hex: 1B 52
BASIC: CHR$(27);"R";

ESC S n **Set Superscript/Subscript On:** If n is 1, then subscript (1/2 inch below the line) is selected; if it is 0, then superscript (1/2 inch above the line) is selected. Since these two attributes are mutually exclusive, an ESC S command overrides any previous ESC S setting. Also, see ESC T below.

n = 1 subscript
n = 0 superscript

Decimal: 27 83 <n>
Hex: 1B 53 <n>
BASIC: CHR$(27);"S<n>";

ESC T **Cancel Superscript/Subscript:** Returns to previous baseline position. Also. in this chapter see ESC S.

Decimal: 27 89
Hex: 1B 54
BASIC: CHR$(27);"T";

ESC U n **Set Unidirectional Printing**

n = 0 unidirectional printing is turned off
n = 1 unidirectional printing is turned on

Decimal: 27 85 <n>
Hex: 1B 55 <n>
BASIC: CHR$(27);"U<n>";

ESC W n

Set Double-Wide Print On/Off: When enabled, printable characters are printed twice their current width. This sequence has precedence over the SO control code.

n = 1: doublewide is enabled
n = 0: doublewide is disabled

Decimal: 27 87 <n>
Hex: 1B 57 <n>
BASIC: CHR$(27);"W<n>";

ESC X n m

Set Horizontal Margins: This sequence sets the left (n) and right (m) margins. The interval is based on the current cpi setting. Variable (m) must be greater than W. and the sequence must include both variables.

Decimal: 27 88 <n> <m>
Hex: 1B 5B <n> <m>
BASIC: CHR$(27);"X<n><m>";

PROPRINTER DOT GRAPHICS

Dot graphics allows you to print individual dots at any position on the page. The Proprinter doesn't adjust the line feed increment automatically on entering graphics. If you want contiguous vertical graphics, then you must set the line feed increment to 8/72 inch before starting graphics and then reset it when you are finished.

An IBM graphics control sequence starts with an escape combination that sets the graphics density (ESC K, L, Y, or Z), followed by a 2-byte header that shows the number of subsequent bytes that are to be interpreted as graphics data. The format of the sequence is:

ESC (density) <n1> <n2> (data) .. (data)

Since this control sequence has no terminator, you need to specify exactly in the header the number of bytes that you want to be interpreted as graphics. If there are fewer graphics data bytes than specified in the header, then the printer treats subsequent text and control codes as graphics. In that case, carriage returns and line feeds are often ingested as graphics data.

On the other hand, if there are more graphics data bytes than specified in the header, then the printer interprets excess bytes as text or control codes. This can also produce indeterminate results.

The two bytes (n1, n2) specify the total number of image bytes that follow; n2 is the most significant byte.

The total number of image data bytes - n1 + (n2 * 256)

EXAMPLE: to print 5 inches of graphics at ESC K density, which is 60 dpi, then:

Total bytes = 5 inches x 60 dpi = 300
n1 = total bytes modulo 256, in other words,
n1 = total bytes – (n2 * 256)
n1 = 300 - (1 * 256)
n1 = 44
n2 = integer (total bytes/256)
n2 = integer (300/256) = 1

The sequence sent to the printer (shown in BASIC) would look like:

CHR$(27);CHR$"K';CHR$(44);CHR$(1);CHR$(v1);... CHR$(v3OO);

where v1 through v3OO are image data bytes.

Each image data byte represents a vertical column of eight dots. The most significant bit of the byte controls the top dot of a column, and the least significant bit controls the bottom dot of that column. The first byte of data (v1) is the first column, (v2) is the second column, and so on. The illustration below shows byte values of various dot combinations.

Weight	Wire	Graphics Dot Pattern																
128	1					●	●	●				●	●	●				
64	2				●				●		●				●			
32	3				●					●					●			
16	4				●					●					●			
8	5					●								●				
4	6						●						●					
2	7							●				●						
1	8								●	●	●							
		0	0	0	112	136	132	130	65	49	65	130	132	136	112	0	0	

Programming Example

The following BASIC program will produce the graphic shown above.

```
100     WIDTH "LPT1:",255
110     FOR N = 1 TO 4
115     LPRINT CHR$(27);"K";CHR$(80);CHR$(0);
120     FOR K = 1 TO 5
140     LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(112);
150     LPRINT CHR$(136);CHR$(132);CHR$(130);
160     LPRINT CHR$(65);CHR$(49);CHR$(65);
170     LPRINT CHR$(130);CHR$(132);CHR$(136);
180     LPRINT CHR$(112);CHR$(0);CHR$(0);
190     NEXT K
200     LPRINT
210     NEXT N
220     LPRINT "DONE"
230     END
```

ESC K nl n2 v1...vn **Normal Density Graphics:** This sequence sets a density of 60 dpi horizontally and 72 dpi vertically.

Decimal: 27 75 <nl> <n2> <v1>. . . <vn>
Hex: 1B 4B <n1> <n2> <v1> . . . <vn>
BASIC: CHR$(27);"K<nl><n2><v1>...<vn>";

ESC L n1 n2 v1...vn **Low Speed Double-Density Graphics:** This sequence sets a density of 120 dpi horizontally and 72 dpi vertically.

Decimal: 27 76 <n1> <n2> <v1>...<vn>
Hex: 1B 4C <n1> <n2> <v1> ... <vn>
BASIC: CHR$(27);"L<nl><n2><vl>...<vn>";

ESC Y n1 n2 v1...vn **High-Speed Double-Density Graphics:** This sets a density of 120 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are specified, then the second dot is not printed.

Decimal: 27 89 <n1> <n2> <v1>...<vn>
Hex: 1B 59 <n1> <n2> <v1>...<vn>
BASIC: CHR$(27);"Y<nl><n2><vl>...<vn>";

ESC Z n1 n2 v1...vn **Quadruple-Density Graphics (Reduced Speed):** Sets a density of 240 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are specified, then the second dot is not printed.

Decimal:	27 90 <n1> <n2> <v1>...<vn>
Hex:	1B 5A <n1> <n2> <v1>...<vn>
BASIC:	CHR$(27);"Z<nl><n2><vl>...<vn>";

CHAPTER 6. EPSON FX286-E EMULATION

INTRODUCTION

The FX288-e emulation causes the 5000 printers to emulate a 9-wire dot matrix printer.

Conventions Used in this Chapter

In contrast to ANSI, where an argument is expressed as an ASCII decimal integer, Escape control sequences take binary arguments. For example, the control sequence to set form length in lines is:

ESC C n

The sequence to set a 66-line form, expressed in BASIC, would be:

```
LPRINT CHR$(27);"C";CHR$(66);
```

which could alternately be expressed as:

```
LPRINT CHR$(27);"CB";
```

In contrast, when arguments 1 and 0 are used to turn something on and off, you can send the argument in either binary or ASCII. For example, you can turn underline on by sending:

```
CHR$(27);CHR$(45);CHR$(1);
```

or you can send

```
CHR$(27);CHR$(45);"1";
```

The physical spaces in the escape sequences shown in this publication are only for clarification purposes and are not used in the actual string.

If a space is actually needed in the sequence, it will be shown as SP.

Print Mode Combinations

The chart below shows those print modes that can be used together and those that cannot. When an FX-286e command is received to turn on two print modes that are incompatible, one of them will take precedence over the other one. This Is indicated in the chart below by showing the letter of the higher precedence mode at the *intersection of* the two modes. For example, when combining the double-high and compressed modes (an impossible combination), the double-high mode, represented by the letter "D" at the intersection of the two modes, will take precedence and become the active print mode.

PRINT MODE	Normal	Compressed	Emphasized	NLQ	Super/Subscript	Double-Wide	Underline	Double-Strike	Double-High	Proportional	Italics
(N) Normal		C		Q							I
(C) Compressed	C			C					D	P	
(E) Emphasized											
(Q) NLQ	Q										
(S) Super/Subscript				S					D		
(W) Double Wide											
(U) Underline											
(O) Double-Strike				Q							
(D) Double-High		D			D						
(P) Proportional		P									
(I) Italics	I			I							

FUNCTIONAL DIFFERENCES

The following is a list of functional differences between this printer's emulation and the FX-286e printer.

- The maximum line length is 13.6 inches (136 columns at 10cpi, 816 graphics columns per line at 60 dpi).
- Special enhanced print modes are not available when the "paper low" condition is reached.
- The number of characters that can be discarded by the CAN command is different due to a different buffer size.
- The delete code is discarded.
- The Auto Feed XT function (pin 14 on the parallel interface connector) is not implemented.
- Double-wide and double-high print characters appear to have wider dots due to offset printing.
- Adjacent dots can be printed when ESC Y or ESC Z graphics are selected. This provides a sharper image of higher density.
- All 12 dot rows will print when using 12-high characters in a superscript or subscript.
- Superscript characters are not underlined in a different dot row.
- Even though the escape sequence and data to print nine-bit graphics are accepted, the data byte containing the ninth bit is discarded and only the top eight bits of data are printed.
- The printer has more than 80 character sets that may be selected from the CCU menu.
- Horizontal densities available are 60, 120, and 240 dpi. When 72 dpi is received, it is converted to 60 dpi. When densities of 80, 90, or 144 are received, they are converted to 120 dpi.
- The widths of the proportional characters are slightly different.
- The Courier NLQ font is used for Roman.
- The Gothic font is used for Sans Serif.
- The italic font prints only in NLQ mode.
- The character graphics font prints only in draft mode.

ADDITIONAL ESCAPE SEQUENCES

The following escape sequences are supported by this emulation, but are not part of the FX-286e command set:

ESC (t	Assign a code page to one of four variables (0, 1, 2, or 3)
ESC (T	Assign a code page to variable "1"
ESC j n	Reverse n/216 paper move
ESC 1	Select 7/72-inch line spacing.

UNSUPPORTED ESCAPE SEQUENCES

The following escape sequences from the FX-286e command set are not supported by this emulation and are therefore discarded:

ESC EM	Sheet feeder
ESC %	User-defined character set
ESC &	User-defined characters
ESC 8	Paper out sensor on
ESC 9	Paper out sensor off
ESC :	Copy ROM to RAM
ESC a	NLQ justification

FX-286E CONTROL CODES

BEL — **Bell (07H):** Sounds the beeper.

BS — **Backspace (08H):** Flushes all print data and then moves the print position one character width to the left based on the current character spacing. If this code is received immediately after graphic printing, the print position of subsequent data is moved back to the point at which graphic printing started.

CAN — **Cancel (18H):** Causes all printable data received since the last line terminator or escape sequence, whichever occurred later, to be deleted. Data on previous lines that has been auto-wrapped will not be deleted. This code is a line terminator. The current print position will be retained. Also, cancels the double width print mode initiated by the SO control code.

CR — **Carriage Return (0DH):** Flushes all print data and positions the print position at the left margin for subsequent printable data to be printed. This code Is a line terminator and will terminate the double width print mode initiated by a received SO code.

DC1 — **Device Control 1 (11H):** Causes printing to resume after the printer has been deselected by a DC3 code. It will not resume printing if printer was halted by pressing the On Line key on the control panel.

DC2 — **Device Control 2 (12H):** Cancel condensed mode. This ends the current print buffer and causes its contents to print. The condensed print mode is then canceled and printing resumes at 10 cpi (5 cpi double-wide) or 12 cpi (6 cpi double-wide) depending on which one was previously selected.

DC3 — **Device Control 3 (13H)**

Serial Interface: Deselect printer. The printer can be selected again by a DC1 command or by the online key.

Parallel Interface: Treated the same as the NUL control code.

DC4 — **Device Control 4 (14H):** Cancels double width printing initiated by a SO control code or ESC SO escape sequence and returns to the previously selected print compression (pica, compressed, or elite). It does not cancel double width printing selected by ESC W or ESC 1.

DEL — **Delete (7FH):** The delete character is discarded unless it is made printable via the ESC 6 code expansion sequence.

ESC — **Escape (1BH):** Introduces an escape sequence. It implies that subsequent code(s) will be interpreted by the printer as a printer command. not printable data.

FF — **Form Feed (0CH):** Moves the print position to the top of the next form at the left margin. This code is a line terminator and will terminate the double-width printing mode initiated by a received SO code. All print data is flushed before the form feed occurs.

HT **Horizontal Tab (09H):** If there are tabs set, this code ends the current print buffer and causes its contents to be printed. The horizontal print position moves right to the next horizontal tab stop position. Any tab that causes the current print position to exceed the right print limit, or right margin, will cause a line wrap to occur (CR,LF). Tab positions are absolute. If the character spacing changes, tab positions remain in the same absolute horizontal positions. If there is no tab set between the current print position and the print limit, the tab is ignored and the current print buffer is not affected.

LF **Line Feed (0AH):** Flushes all print data and then advances the paper up one line as determined by the current line spacing. Me print position Is moved to the left margin. This code is a line terminator and will terminate the double-width printing mode initiated by a received SO code. If paper positioning causes the next line to exceed the form length, an automatic form feed will occur.

NUL **Null (00H):** Causes no action when received alone. It is used by some sequences to terminate the parameter list.

SI **Shift In (0FH):** Select condensed print mode. Ends the current print buffer and causes its contents to be printed. This code then enables the condensed printing mode. Characters are condensed to 17.1 cpi for the pica pitch (10 cpi) and 20 cpi for the elite pitch (12 cpi).

Double-wide printing [invoked by SO, ESC I (n), or ESC W commands], together with 17.1 cpi, produces printing at approximately 8.6 cpi. With double-wide and 20 cpi, the resulting print will be approximately 10 cpi. The condensed print mode can be selected, but not activated, while the proportional print mode is active.

SO **Shift Out (0EH):** Select double-wide printing by line. Ends the current print buffer and causes its contents to be printed. This code then starts double-wide printing for subsequent characters until a line terminator, DC4, ESC I (n), or ESC W NUL command is received. Characters are elongated to twice their current width, that is, expanded to take up two character positions each. The tab positions are not changed. If the double-wide print mode is already active by an ESC W or ESC I (n) sequence. the SO code is ignored and the escape sequence takes control.

VT

Vertical Tab (0BH): Ends the current print buffer and causes its contents to be printed. A CR function is always performed upon receipt of a VT code. The VT code then advances the paper vertically to the next vertical tab position in the channel selected by the ESC / sequence. If no channel has been selected, channel zero is used.

Following power-up or initialization, the eight vertical tab channels are in an initialized state (no tabs have been inserted into a specific channel nor has the tab erase command been received). If a VT code Is received at this time, a vertical move equal to the current line spacing is performed. If the command to erase tabs is received (ESC B NUL or ESC bn NUL), received VT codes will produce no vertical motion but will cause a CR to occur.

A maximum of 16 vertical tab positions are allowed for each of the eight channels. If there are tabs in the currently selected table, but no tabs set beyond the current line. a vertical tab will cause paper to advance to the top margin of the next form.

When a vertical tab would cause the printer to exceed the current form length (minus any perforation skip distance) the vertical tab will act as a form feed. Vertical tabs are converted to absolute positions when set. Future changes in line spacing will not change the position of the vertical tabs.

FX-286E ESCAPE SEQUENCE DIRECTORY

Escape Sequence	Definition	Page
ESC SO	Select double-wide print mode	142
ESC SI	Select condensed print mode	135
ESC SP n	Set intercharacter space	135
ESC I n	Master print mode select	145
ESC #	Cancel MSB (most significant bit control)	149
ESC $ nl n2	Set absolute print position	139
ESC - n	Turn underlining ON/OFF	141
ESC / n	Set vertical tab stops	136
Esc | n	Set left margin	133
ESC 0	Select 1/8-inch line spacing	134
ESC 1	Select 7/72-inch line spacing	134
ESC 2	Select 1/6-inch line spacing	134
ESC 3 n	Select n/216-inch line spacing	134
ESC 4	Select italic print mode	143
ESC 5	Cancel italic print mode	143
ESC 6	Printable code area expansion	143
ESC 7	Cancel printable code area expansion	143
ESC <	Select unidirectional mode (1 line)	139
ESC -	Set most significant bit (MSB) to zero	141
ESC >	Set most significant bit (MSB) to one	149
ESC @	Initialize printer	149
ESC A n	Select n/72-inch line spacing	134
ESC B n1...n16 NUL	Set vertical tab stops	136
ESC C n	Set page length in lines	132
ESC C NUL n	Set page length in inches	132
ESC D nl n2 NUL	Set horizontal tab stops	136
ESC E	Select emphasized mode	141
ESC F	Cancel emphasized mode	141
ESC G	Select double-strike mode	141
ESC H	Cancel double-strike mode	141
ESC I n	Printable code area expansion	145
ESC J n	Single variable line feed	138
ESC K n1 n2 v1...vn	Normal density graphics	152
ESC L n1 n2 v1...vn	Low speed double density graphics	152
ESC M	Select elite pitch	135
ESC N n	Set skip over perforation (Epson set bottom margin)	132
ESC O	Cancel skip over perforation (Epson cancel bottom margin)	132
ESC P	Select pica pitch	135
ESC Q n	Set right margin	133
ESC R n	Select the international character set	146
ESC S n	Select superscript/subscript printing	142
ESC T	Cancel superscript/subscript printing	142
ESC U n	Turn unidirectional printing mode ON/OFF	139
ESC Y n1 n2 v1...vn	High speed double density graphics	152
ESC Z n1 n2 v1...vn	Quadruple density graphics	152
ESC \ n1 n2	Set relative print position	140
ESC b c n1 n2 ... n8 NUL	Set vertical tabs in channels 0-7	137

Escape Sequence	Definition	Page
ESC k n	Select font style	144
ESC p n	Turn proportional mode ON/OFF	135
ESC s n	Turn half-speed print mode ON/OFF	140
ESC t n	Select a code page	147
ESC w n	Turn double-high printing ON/OFF	143
ESC x n	Select NLQ or Draft printing	144
ESC (t 3 0 m1 m2 m3	Assign a code page to one of four variables (0, 1, 2, or 3)	147
ESC (T n1 n2 m1...m5	Assign a code page to variable "l"	148
ESC * m nl n2 vl...vn	Select graphics mode (Epson set bit image)	153
ESC ? s n	Reassign graphics mode	153
ESC – m nl n2	Select 9-pin graphics	141

FX-286E ESCAPE SEQUENCE GROUPINGS

The FX-286e escape sequences have been separated according to functionality. Special areas of interest such as character spacing, print modes. and graphics have separate sections.

The sequences are separated as follows:

- Margins
- Line Spacing
- Character Spacing
- Tabs (Horizontal and Vertical)
- Paper Movement
- Print Position
- Print Modes
- Special Character Printing
- Miscellaneous Commands
- Dot Graphics

MARGINS

ESC C n

Set Page Length in Lines: Sets the forms length to n lines. The value for form length is stored in inches and will not change when line spacing Is changed. This sequence resets the top of form value to the current line position and resets the perforation skip mode. Form lengths of zero or greater than 22 inches are ignored and leave the existing form unchanged. The parameter limits are 1-255.

Decimal: 27 67 n
Hex: 1B 43 nH
BASIC: CHR$(27);"C";CHR$(n);

ESC C NUL n

Set Page Length in Inches: Sets the forms length from 1 to 22 inches depending on the value for the parameter n. This sequence resets the top of form value to the current line position and resets the perforation skip mode. Form lengths of zero or greater than 22 inches will be ignored and leave the existing form unchanged. The parameter limits are 1-255.

Decimal: 27 67 0 n
Hex: 1B 43 00 nH
BASIC: CHR$(27);"C";CHR$(0);CHR$(n);

ESC N n

Set Skip Over Perforation: Sets a bottom margin region to avoid printing on the perforation when using continuous forms. The parameter n determines the number of print lines to be included in the skip area. This is converted to an absolute distance in inches based on the current line spacing value. Subsequent changes to the line spacing will not automatically change this setting. When form length is changed (by ESC C NUL n or ESC C n), the skip perforation is cleared. If the skip value exceeds the form's length, it is ignored. A parameter value of zero leaves the previous setting unchanged.

Decimal: 27 78 n
Hex: 1B 4E nH
BASIC: CHR$(27);"N";CHR$(n);

ESC O

Cancel Skip Over Perforation: Resets the skip perforation value to zero.

Decimal: 27 79
Hex: 1B 4F
BASIC: CHR$(27);"O";

ESC | n

Set Left Margin: Sets the left margin to n columns in the current cpi. When proportional mode is in effect, the settings are treated as though they were set for pica (10 cpi horizontal). Before the new margin is set, all print data is flushed. The minimum space allowed between the left and right margin is the distance equal to the width of one double-wide pica character. This command clears any existing horizontal tabs and installs the defaults (every eight columns).

Decimal: 27 108 n
Hex: 1B 6C nH
BASIC: CHR$(27);"l";CHR$(n);

ESC Q n

Set Right Margin: Sets the right margin to n columns in the current pitch. When proportional mode is selected, the settings are the same as they would be for pica pitch (10cpi horizontal). The minimum space between the left and right margin is the width of two pica characters. Note that before the right margin is set, this command sequence causes all print data to be flushed. Column numbering begins at zero. If the right margin value is invalid (within the width of two pica characters of the left margin or exceeds the maximum columns), the current margin is unchanged. This command clears any existing horizontal tabs and installs the defaults (every 8 columns based on the left margin).

Decimal: 27 81 n
Hex: 1B 51 nH
BASIC: CHR$(27);"Q";CHR$(n);

LINE SPACING

ESC 0 **Select 1/8-inch line spacing (8 lpi):** Sets the line spacing to 1/8-inch or 8 lpi.

Decimal: 27 48
Hex: 1B 30
BASIC: CHR$(27);"0";

ESC 1 **Select 7/72-Inch Line Spacing:** Sets the line spacing to 7/72 of an inch.

Decimal: 27 49
Hex: 1B 31
BASIC: CHR$(27);"1";

ESC 2 **Select 1/6-Inch Line Spacing (6 lpi):** Sets the line spacing to 1/6-inch.

Decimal: 27 50
Hex: 1B 32
BASIC: CHR$(27);"2";

ESC 3 n **Select n/216-Inch Line Spacing:** Sets the line spacing to n/216 of an inch. This permits line spacing from 0 inches (0/216) to 1.18 inches (255/216). This command is recommended with n=24 to set the proper line spacing when printing graphics.

Decimal: 27 51 n
Hex: 1B 33 nH
BASIC: CHR$(27);"3";CHR$(n);

ESC A n **Select n/72-Inch Line Spacing:** Selects and activates n/72-inch line spacing.

Decimal: 27 65 n
Hex: 1B 41 nH
BASIC: CHR$(27);"A";CHR$(n);

CHARACTER SPACING

ESC SI **Select Condensed Print Mode:** Performs the same function as the SI control code.

Decimal: 27 15
Hex: 1B 0F
BASIC: CHR$(27);CHR$(15);

ESC M **Select Elite Pitch:** This sets the pitch to 12 cpi.

Decimal: 27 77
Hex: 1B 4D
BASIC: CHR$(27);"M";

ESC P **Select Pica Pitch:** This sets the pitch to 10 cpi.

Decimal: 27 80
Hex: 1B 50
BASIC: CHR$(27);"P";

ESC p n **Turn Proportional Mode On/Off:** Turns the proportional print mode on or off according to the value of n.

n	Effect
1	Unidirectional printing on
0	Unidirectional printing off

This command overrides the condensed print mode.

Decimal: 27 74 n
Hex: 1B 4A nH
BASIC: CHR$(27);"J";CHR$(n);

ESC SP n **Set Intercharacter Spacing:** Sets the amount of space added to each character in increments of 1/120-inch. This space is added to the space already allocated in the character's design. Parameter limits are 0-63 (decimal).

Decimal: 27 32 n
Hex: 1B 20 n
BASIC: CHR$(27);CHR$(32);CHR$(n);

TABS

ESC B n1...n16 NUL **Set Vertical Tab Stops:** Sets up to 16 vertical tabs in channel at the indicated line numbers in the current line spacing. The list of tab stops must be terminated by the NUL code. Any line that is not referenced in the list is cleared by this command. Therefor, the command sequence ESC B NUL will clear all vertical tab stops. The parameters n1, n2, . . . must be in ascending order and the limits of the parameters are 1-255 (decimal).
Vertical tabs are converted to absolute positions as they are set. Future changes in line spacing will not change the position of the tabs.

Decimal: 27 66 (n1) ... (n16) 0
Hex: 1B 42 (n1H) . . . (n16H) 00
BASIC: CHR$(27);CHR$(66);CHR$(n1);... CHR$(n16);CHR$(0);

ESC D n1...n32 NUL **Set Horizontal Tab Stops:** Sets up to 32 horizontal tab stops at the indicated column numbers. The list of tab stops must be terminated by a NUL code. Any column that is not referenced in the list is cleared by this command. Therefor, the command ESC D NUL will clear all horizontal tabs. The parameters must be in ascending order. If a tab parameters occurs which is out of sequence, the command is assumed to be terminated; all subsequent data is ignored until a NUL code is encountered.
Decimal: 27 68 n1 ... n32 0
Hex: 1B 44 n1H ... n32H 00
BASIC: CHR$(27);"D";CHR$(n1);...;CHR$(n32);CHR$(0);

ESC / n **Set Vertical Tab Stops:** Selects the vertical tab channel. All subsequent vertical tab commands (VT) will use this selected channel.

Decimal: 27 47 n
Hex: 1B 2F nH
BASIC: CHR$(27);"/";CHR$(n);

ESC b c n1 n2...n8 NUL

Set Vertical Tabs in Channels 0 Through 7: Sets vertical tab stops in any one of 8 vertical tab channels numbered 0 through 7. This allows you to set up to 8 different groups of vertical tabs. The list of tab stops must be terminated by the NUL code. Any line that is not referenced in the list is cleared by this command. Therefor, the command sequence ESC b (c) NUL will clear all vertical tab stops within the channel (c). The parameters (n1), (n2), etc., must be in ascending order and the limits of the parameter values are 1-255 (decimal).

Vertical tabs are converted to absolute positions as they are set. There is no automatic linkage between the value of line spacing and vertical tab positions: subsequent changes in the value for line spacing will not cause the tab positions to change.

Decimal:	27 98 c n1 n2 ... n8 0
Hex:	1B 62 cH n1H n2H ... n8H 00
BASIC:	CHR$(27);"b";CHR$((c));CHR$(n1);CHR$(n2);...; CHR$(0);

PAPER MOVEMENT

ESC J n

Single Variable Line Feed: This sequence causes the contents of the print buffer to print. The print position is then moved down the page by the distance specified by the parameter in 1/216-inch increments. This sequence does not affect spacing of subsequent line actions. The parameter values allow a vertical movement from 0 to 1.18 inches (255/216). If n is not an exact multiple of 3/216=1/72-inch, then the movement is approximate. The parameter n=24 can be used to get the exact line spacing for the eight-bit graphics mode.

Zero is a valid parameter value that produces no vertical motion.

n	Spacing
21	7 dots
24	8 dots
27	8 lpi
36	6 lpi (12 dots

Decimal: 27 74 n
Hex: 1B 4A nH
BASIC: CHR$(27);"J";CHR$(n);

PRINT POSITION

ESC <

Select Unidirectional Mode (1 Line): Forces unidirectional print, from right to left, in the line in which this command is embedded. Unidirectional printing begins with the first character following receipt of this command and is canceled by a carriage return.

Decimal: 27 60
Hex: 1B 3C
BASIC: CHR$(27);"<";

ESC U n

Turn Unidirectional Printing ON/OFF: Causes the printer to print in only one direction [prints with the shuttle moving from right to left) or in both directions according to the value of parameter n as follows:

n	Effect
1	Unidirectional printing on
0	Unidirectional printing off

When turning unidirectional printing off, the command should be the first character in the line to be printed bidirectionally.

Decimal: 27 85 n
Hex: 1B 55 nH
BASIC: CHR$(27);"U";CHR$(n);

ESC $ n1 n2

Set Absolute Print Position: Specifies the distance from the current left margin where subsequent characters are to be printed. If the position specified is beyond the right margin, this command sequence is ignored and the previous settings remain in effect. Argument units are 1/60 Inch, expressed as n1 + (n2 x 256).

Example: To establish a position 6.3 inches from the left margin:

6.3 x 60 = 378 (total number of 1/60-tnch increments)
378/256 =1 with a remainder of 122
n1 = 122
n2 = 1

Expressed in BASIC this is:

CHR$(27);"$";CHR$(122);CHR$(1);

Decimal: 27 36 (n1) (n2)
Hex: 1B 24 (n1H) (n2H)
BASIC CHR$(27);"$";CHR$(nl);CHR$(n2);

ESC \ n1 n2

Set Relative Print Position: Sets the position where printing will occur next relative to the current print position. Parameters n1 and n2 are in 1/120-inch increments and are expressed as n1 + (n2 x 256). Parameter limits for n1 and n2 are 0-255.

Example 1: If you want to move 4 inches to the right, then:

4 x 120 = 480 (total number of 1/120-inch increments
480/256 = 1 with a remainder of 224
n1 = 224
n2= 1

Expressed In BASIC, this is:

CHR$(27);CHR$(92);CHR$(224);CHR$(1);

Example 2: If you want to move 4 inches to the left, then:

65,536 - 480 = 65,056
65,056/256 = 254 with a remainder of 32
n1 - 32
n2 – 254

Expressed in BASIC, this is:

CHR$(27);CHR$(92);CHR$(32);CHR$(254);

Decimal: 27 92 (n1) (n2)
Hex: 1B 5C (n1H) (n2H)
BASIC: CHR$(27);CHR$(92);CHR$(n1);CHR$(n2);

ESC s n

Turn Half-Speed Print Mode ON/OFF: Turns the half-speed print mode on or off according to the value of the parameter n below. Half speed printing is accomplished by only printing when the shuttle is moving from right to left.

n=1 half-speed on
n=0 half-speed off

Decimal: 27 115 n
Hex: 1B 73 nH
BASIC CHR$(27);"s";CHR$(n);

PRINT MODES

ESC - n

Turn Underlining ON/OFF: Enables or disables automatic underlining depending on the parameter n as follows:

n=1 enable underline
n=0 disable underline

The underline will be positioned on dot row 9 of draft characters and row 18 of NLQ characters. Block characters (ASCII 176-223, 244, and 245) will not be underlined.

Decimal: 27 45 (n)
Hex: 1B 2D (nH)
BASIC: CHR$(27);CHR$(45);CHR$(n);

ESC E

Select Emphasized Mode: This causes subsequent printing to be emphasized. The print speed is half of the normal speed because the characters are printed twice. The second pass is offset about 1/120-inch for draft fonts and 1/240-inch for NLQ fonts.

Decimal: 27 69
Hex: 1B 45
BASIC: CHR$(27);"E";

ESC F

Cancel Emphasized Print Mode: Cancels the emphasized printing mode turned on by ESC E.

Decimal: 27 70
Hex: 1B 46
BASIC: CHR$(27);"F";

ESC G

Select Double-Strike Mode: Causes the contents of the print buffer to be printed and starts double-stroke printing when not in the NLQ mode. Each line of text is printed twice (direct overprint of each dot).

Decimal: 27 71
Hex: 1B 47
BASIC: CHR$(27);"G";

ESC H

Cancel Double-Strike Mode: Cancels the double-strike printing mode turned on by ESC G.

Decimal: 27 72
Hex: 1B 48
BASIC: CHR$(27);"H";

ESC S n

Select Superscript/Subscript Printing: This sequence ends the current print buffer and causes its contents to be printed. In each mode, the character is shortened to half height and then positioned in the upper (superscripts or lower (subscript) half of the print line. These print modes are mutually exclusively. Selects superscript or subscript printing according to the value of n as follows:

n=1 enable subscript
n=0 enable superscript

NOTE

The superscript or subscript mode is not allowed when double-high print is selected. Either can be selected during double-high printing, but they will not take effect until the double-high mode is canceled.

Decimal: 27 83 (n)
Hex: 1B 53 (nH)
BASIC: CHR$(27);"S";CHR$(n);

ESC T

Cancel Superscript/Subscript Printing: Cancels the superscript or subscript printing mode. Characters are printed at their normal size and previous baseline positions.

Decimal: 27 84
Hex: 1B 54
BASIC: CHR$(27);"T";

ESC SO

Select Double-Wide Printing (1 Line): Performs the same function as the SO control code.

Decimal 27 14
Hex 1B 0E
BASIC CHR$(27);CHR$(14);

ESC W n

Turn Double-Wide Printing Mode ON/OFF: Turns double-wide printing on or off according to the parameter n as follows:

n=1 double-wide on
n=0 double-wide off

NOTE

If double-wide had been turned on previously by the SO control code, this mode is canceled and the ESC W sequence has control.

Decimal: 27 87 <n>
Hex: 1B 57 <n>
BASIC: CHR$(27);"W<n>";

ESC w n

Turn Double-High Printing ON/OFF: Turns double-high printing on or off according to the value of parameter n as follows:

n=1 double-high on
n=0 double-high off

NOTE
Superscript subscript. and condensed modes are not valid in the double-high mode.

Decimal: 27 119 n
Hex: 1B 77 nH
BASIC: CHR$(27);"w";CHR$(n);

ESC 4

Select Italic Print Mode: Causes characters to be printed from the italic set. In the lower section of the character table (range 0-127 decimal), all printable characters will print in the italics mode. In the upper section of the character table (range 128-255). the characters to be printed win be determined by the table selected (either by the ESC t (n) sequence or emulation strap 2. If italics has been selected for the upper section, they Will be duplicates of the 7-bit italic characters in the lower table (0-127). If, however, an 8-bit code page is selected, the characters will be 128-255 from the specified code page printed in italics.

Decimal: 27 52
Hex: 1B 34
BASIC: CHR$(27);"4";

ESC 5

Cancel Italic Mode: This command cancels the italic print mode set by the ESC 4 code.

Decimal: 27 53
Hex: 1B 35
BASIC: CHR$(27);"5";

ESC 6

Printable Code Area Expansion: This command enables the printing of codes 128-159 decimal as characters. If the upper section of the character table (range 128-255) has italics selected (ESC t or emulation option 2), the codes 128 through 159 win print from the international substitution characters. If, however, an 8-bit code page has been selected for the upper section of the table, characters will print from the selected code page.

Decimal: 27 54
Hex: 1B 36
BASIC: CHR$(27);"6";

ESC 7

Cancel Printable Code Page Expansion: Causes codes 128-159 to be executed as control codes, thereby canceling any previous ESC 6 command.

Decimal: 27 55
Hex: 1B 37
BASIC: CHR$(27);"7";

ESC ! n

Master Print Mode Select: Selects any valid combination of the printing modes listed below. The parameter n is equal to the sum of the decimal values associated with each mode. Note that pica and elite are mutually exclusive and proportional overrides condensed. Also, pica and elite proportional are the same. (See "Print Mode Combinations," page 7-2.)

n	Effect
0	Pica
1	Elite
2	Proportional
4	Condensed
8	Emphasized
16	Double-Strike
32	Double-Width
64	Italic
128	Underline

Decimal: 27 33
Hex: 1B 21
BASIC: CHR$(27);"1";CHR$(n);

ESC k n

Select Font Style: Selects the Roman (Courier) typeface if n is 0 and Sans Serif (Gothic) if n is 1. This command will not activate the selection. but sets the style to be activated by the ESC x (n) sequence. Refer to the "Functional Differences" section on page 7-4 for a description of typefaces used.

Decimal: 27 107
Hex: 1B 6B
BASIC: CHR$(27);"k";CHR$(n);

ESC x n

Select NLQ or Draft Printing: Selects NLQ or draft printing. When selecting NLQ, the style will be the one that was last selected by the ESC k (n) sequence.

n=1 NLQ
n=0 draft

Decimal: 27 120
Hex: 1B 78 -
BASIC: CHR$(27);"x";CHR$(n);

SPECIAL CHARACTER PRINTING

ESC I n

Printable Code Area Expansion: If n is binary or ASCII one, some ASCII codes between 0-31, and some or all codes between 128-159 inclusive, become printable as characters. If ESC 6 has been sent prior to this command, then all of the characters between 128 and 159 inclusive are printable. These characters come from the international character substitution set.

Not all control codes between 0 and 31 inclusive can be made printable because if the ESC code became printable. For example, no more escape commands could be received. If the parameter n is binary or ASCII zero, these codes return to the non-printable state.

Following is a chart showing an executed code between 0 and 31 and between 128 and 159 inclusive. If a control code can never be made into a printable character, the standard symbol for the code is printed instead of its ASCII number. To the right of these codes is the name of the character that is printed. Note that this chart assumes that an ESC 6 command has already been received and that the italics mode has been selected (via ESC t or emulation option 2) for the upper section of the table (range 128-255). Otherwise,

control codes such as FF, CR etc. would be executed in the region 128-159 inclusive instead of printing an international character. This sequence causes some ASCII codes between 0-31, and some or all codes between 128-159 inclusive, to become printable as characters when n is 1. When n is 0, these ASCII codes are non-printing characters.

EXECUTED ASCII CODE				
Range 1		Range 2		
Decimal	Hex	Decimal	Hex	Character Printed
0	00	128	80	grave a (à)
1	01	129	81	grave e (è)
2	02	130	82	grave u (ù)
3	03	131	83	grave o (ò)
4	04	132	84	grave i (ì)
5	05	133	85	angstrom (°)
6	06	134	86	U.K. pound symbol (£)
BEL	BEL	135	87	Inverted ! (¡)
BS	BS	136	88	Inverted ? (¿)
HT	HT	137	89	tilde N (Ñ)
LF	LF	138	8A	tilde n (ñ)
VT	VT	139	8B	int'l monetary sym ( )
FF	FF	140	8C	pesetas
CR	CR	141	8D	angstrom A (Å)
SO	SO	142	8E	angstrom a (å)
SI	SI	143	8F	cedilla c (ç)
16	10	144	90	section mark (§)
17	11	145	91	eszet
DC2	DC2	146	92	AE diphthong (Æ)
DC3	DC3	147	93	ae diphthong (æ)
DC4	DC4	148	94	slashed O (Ø)

EXECUTED ASCII CODE				
Range 1		Range 2		
Decimal	Hex	Decimal	Hex	Character Printed
21	15	149	95	slashed o (ø)
22	16	150	96	umlaut accent (¨)
23	17	151	97	umlaut A (Ä)
CAN	CAN	152	98	umlaut O (Ö)
25	19	153	99	umlaut U (Ü)
26	1A	154	9A	umlaut a (ä)
ESC	ESC	155	9B	umlaut o (ö)
28	1C	156	9C	umlaut u (ü)
29	1D	157	9D	acute E (É)
30	1E	158	9E	acute e (é)
31	1F	159	9F	yen sign (¥)

Decimal: 27 73 n
Hex: 1B 49 nH
BASIC: CHR$(27);"I";CHR$(n);

ESC R n

Selects the International Character Set: Selects the international character substitution set for the ASCH codes between 35 and 126 decimal inclusive. The following parameters define which substitution set is selected.

n	Country
0	USA
1	France
2	Germany
3	UK
4	Denmark I
5	Sweden
6	Italy
7	Spain I
8	Japan
9	Norway
10	Denmark
11	Spain II
12	Latin America
13	Netherlands
14	Anglo-Universal
15	Spanish America
16	Portugal
17	Africa
18	Switzerland
19	Turkey
20	Greece
21	Yugoslavia

Decimal: 27 82 n
Hex: 1B 52 nH
BASIC CHR$(27);"R";CHR$(n);

ESC t n

Select a Code Page: Selects one of four variables that contains a specific code page selection. The four variables are loaded via the ESC (t and the ESC [T sequences. The four variables are identified as 0,1,2. and 3 (either binary or ASCII values). This command overrides the condition set by the CCU menu . Note that italics print can be selected by using the ESC 4 command even if the eight bit code page table has been selected.

The four selection variables have the following defaults:

n	Effect
0	No code page (italics 0-128 in upper table
1	USA code page 437
2	No code page (italics 0-128 in upper table
3	USA code page 437

Decimal: 27 116 <n>
Hex: 1 B 74 <n>
BASIC: CHR$(27);"t<n>";

ESC (t, n1 n2 m1 m2 m3

Assign a Code Page to One of Four Variables (0, 1, 2, or 3): Assigns a specific code page to one of the four selection variables used by the ESC t sequence (either the binary or ASCII value can be used for ml). Listed below are the values for m2 and m3 required to assign specific code pages to the select variable ml.

Note that this sequence is similar to the ESC (T sequence except that fewer code page choices are available. Also when using this command, assignments can be made to any of the four different select variables used by the ESC t sequence.

Hex Values		Character Table
m2	m3	
x00	x00	Italic (0-127)
x01	x00	PC 437 (USA)
x03	x00	PC 850 (Multilingual)
x05	x00	PC 853 (Turkish)
x06	x00	PC 855 (Cyrillic)
x07	x00	PC 860 (Portuguese)
x08	x00	PC 863 (Canada-French)
x09	x00	PC 865 (Norway)
x0A	x00	PC 852 (East Europe)
x0B	x00	PC 867 (Turkish)
x0D	x00	PC 864 (Arabic)
x0E	x00	PC 866 (Russian)
x0F	x00	PC 869 (Greek)
x10	x00	USSR GOST (Russian)
x01	x10	PC 437 (Greek
x2C	x00	858
x1D	x0F	8859-15

Some code pages might not be available in all font sets. If the sequence specifies a code page that is not currently installed, the sequence is ignored.
Decimal: 27 40 116 3 0 m1 m2 m3
Hex: 1B 28 74 3 0 m1H m2H m3H
BASIC: CHR$(27);"[t";CHR$(3);CHR$(0);CHR$(m1)
CHR$(m2);CHR$(m3);

ESC (T nl n2 m1...m5

Assign a Code Page to Variable 1: Assigns a code page to (n2)(m1) the 1 variable used by the ESC t sequence. Note that this sequence is very similar to the ESC (t sequence except that variable 1 is the only variable that can accept a code page assignment. Also, more code page choices are available by using this sequence rather than the ESC (t sequence.

If a code page is selected that is not supported by the current font set or an invalid parameter is received, the sequence will be discarded and the multilingual code page will remain unchanged. Some code pages might not be available in a specific set of firmware. If the sequence specifies a code page that is not currently installed, the sequence is ignored.

Parameters n1, n2, and ml through m3 are discarded by the emulation; however, they must appear in the sequence and represent some value (or zero).

The following table lists the parameters required to select the different code pages.

m4	m3	Code Page
00	00	No change from current setting
01	B5	Code page 437 (USA)
03	52	Code page 850 (multilingual)
03	54	Code page 852
03	55	Code page 853 (Cyrillic)
03	59	Code page 857
03	5C	Code page 860
03	61	Code page 865 (Norway)
03	62	Code page 866 (Russian)
03	63	Code page 867
03	65	Code page 869
21	7C	USSR GOST (Russian)
21	7D	Code page 437 (Greek)
21	7E	DEC multinational (LA-210)
21	7F	Roman 8
21	80	Mazowia (Polish)
21	81	Turkey
21	82	Greece
21	8F	ISO 8859-1 Western Europe
21	90	ISO 8859-2 Eastern Europe
21	91	ISO 8859-3 Southern Europe
21	92	ISO 8859-4 Northern Europe
21	93	ISO 8859-5 Cyrillic
21	94	ISO 8859-6 Arabic
21	95	ISO 8859-7 Greek
21	96	ISO 8859-8 Hebrew
21	97	ISO 8859-9 Southern Europe 2
17	1B	ISO 8859-15
03	5A	Code Page 858

Decimal: 27 91 84 n1 n2 m1 ... m5
Hex: 1B 5B 54 n1H n2H m1H ... m5H
BASIC: CHR$(27);"[T";CHR$(n1);CHR$(n2);
CHR$(m1); . . .;CHR$(m5)

MISCELLANEOUS COMMANDS

ESC # **Cancel MSB (Most Significant Bit) Control:** Cancels the most significant bit control set by either ESC = or ESC >.

Decimal: 27 35
Hex: 1B 23
BASIC: CHR$(27);"#";

ESC = **Set Most Significant Bit (MSB) to Zero:** Sets the most significant bit of all incoming data to zero. This command has no effect on graphics or user-defined characters.

Decimal: 27 61
Hex: 1B 3D
BASIC: CHR$(27);"=";

ESC > **Set Most Significant Bit (MSB) to One:** Sets the most significant bit of all incoming data to one. This command has no effect on graphics or user-defined characters.

Decimal: 27 62
Hex: 1B 3E
BASIC: CHR$(27);">";

ESC @ **Initialize Printer:** Flushes all data in the print buffer preceding the command and then initializes the printer. Does not change straps, pitch, or print quality.

Decimal: 27 64
Hex: 1B 40
BASIC: CHR$(27);"@";

FX-286E DOT GRAPHICS

Dot graphics allows you to print individual dots at any position on the page, and thus to print pictures as well as text. While in graphics mode, emphasized, double-strike. expanded, underlined, subscript and superscript remain as set, but are inactive.

The FX-286e printer doesn't adjust the line feed increment automatically on entering graphics. If contiguous vertical graphics is desired, then set the line feed increment to 8/72 inch before starting graphics and then reset it when finished. See Line Spacing Commands on page 134.

An FX-286e graphics control sequence starts with an escape combination that sets the graphics density (ESC K, L, Y, or Z). followed by a 2-byte header that shows the number of subsequent bytes that are to be interpreted as graphics data. The format of the sequence is:

ESC (density) (n1) W) (data) ... (data)

Since this control sequence has no terminator, you need to specify exactly in the header the number of bytes that you want to be interpreted as graphics. If there are fewer graphics data bytes than specified in the header, then the printer treats subsequent text and control codes as graphics. In that case, carriage returns and line feeds are often ingested as graphics data.

On the other hand, if there are more graphics data bytes than specified in the header, then the printer interprets excess bytes as text or control codes. Mils can also produce very interesting results.

Specifying Graphics Line Length

The two bytes (n1, n2) specify the total number of image bytes that follow; n2 is the most significant byte.

total number of image data bytes = n1 + (n2 x 256)

Example: To print 5 inches of graphics at ESC K density, which is 60 dpi, then:

total number of bytes = 5 inches x 60 dpi - 300

300/256 = 1 with a remainder of 44
n1 = 44
n2 = 1

The sequence sent to the printer (shown in BASIC) would look like:

CHR$(27);CHR$"K";CHR$(44);CHR$(1);CHR$(v1);. . . CHR$(v300);

where v1 through v3OO are image data bytes.

Image Data Bytes

The FX-286e printer supports both 8-pin and 9-pin vertical formats. Since this emulation supports only 8-pin graphics, 9-pin graphics will not be explained or illustrated here. When 9-pin graphics are sent to this printer. the byte containing the 9th bit is discarded.

Each image data byte represents a vertical column of eight dots. The most significant of the eight bits controls the top pin of a column and the least significant bit controls the bottom pin of that column The first byte of data (v1) Is the first column (v2) is the second column, and so on. The illustration below shows byte values of various dot combinations.

Weight	Wire	Graphics Dot Pattern															
128	1					●	●	●				●	●	●			
64	2				●				●		●				●		
32	3				●					●					●		
16	4				●					●					●		
8	5					●								●			
4	6						●						●				
2	7							●				●					
1	8								●	●	●						
		0	0	0	112	136	132	130	65	49	65	130	132	136	112	0	0

Image Byte Values

Graphics Programming Example

```
100 WIDTH "LPT1:",255
110 FOR N - 1 TO 4
115 LPRINT CHR$(27);"K";CHR$(80);CHR$(0);
120 FOR K - 1 TO 5
140 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(112);
150 LPRINT CHR$(136);CHR$(132);CHR$(130);
160 LPRINT CHR$(65);CHR$(49);CHR$(65);
170 LPRINT CHR$(130).CHR$(132);CHR$(136);
180 LPRINT CHR$(112);CHR$(0):CHR$(0);
190 NEXT K
200 PRINT
210 NEXT N
220 LPRINT "DONE"
230 END
```

Printed Results of Sample Program

FX-286E DOT GRAPHICS CONTROL SEQUENCES

ESC K n1 n2 v1...vn Normal Density Graphics: Sets a density of 60 dpi horizontally and 72 dpi vertically.

Decimal: 27 75 n1 n2 v1...vn
Hex: 1B 4B n1H n2H v1H...vnH
BASIC: CHR$(27);"K";CHR$(n1);CHR$(n2);CHR$(v1);...; CHR$(vn);

ESC L n1 n2 v1...vn Low-Speed Double-Density Graphics: Sets a density of 120 dpi horizontally and 72 dpi vertically. If horizontally-adjacent dots are sent, they will be printed.

Decimal: 27 76 n1 n2 v1. vn
Hex: 1B 4C v1H ... vnH
BASIC: CHR$(27);"L";CHR$(n1);CHR$(n2);CHR$(v1);...; CHR$(vn);

ESC Y n1 n2 v1...vn High-Speed Double-Density Graphics: Sets a density of 120 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are sent, they will be printed.

Decimal: 27 89 n1 n2 v1 ... vn
Hex: 1B 59 n1H n2H v1H ... vnH
BASIC: CHR$(27);"Y";CHR$(n1);CHR$(n2);CHR$(v1);...; CHR$(vn);

ESC Z n1 n2 v1...vn Quadruple-Density Graphics (Reduced Speed): Sets a density of 240 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are sent. they will be printed.

Decimal: 27 90 n1 n2 v1 ... vn
Hex: 1B 5A n1H n2H v1H v2H
BASIC: CHR$(27);"Z";CHR$(n1);CHR$(n2);CHR$(v1) ... (v2)

ESC * m n1 n2 v1...vn

Select Graphics Mode: Selects graphics mode m (see table below) for n1 + (n2 x 256) columns. The variables n1 and n2 represent the number of data bytes to be sent that will be interpreted as graphics. If the number of graphics columns to be printed causes printing to exceed the right margin, all data beyond that margin will be ignored.

m	Graphics Mode	DPI
0	Single-density	60
1	Double-density	120
2	High-speed double-density	120
3	Quadruple-density	240
4	CRT I	120
5	Plotter (1:1)	60
6	CRT II	120
7	Double-density plotter	120

Decimal: 27 42 n1 n2 v1...vn
Hex: 1B 2A n1H n2H v1H...vnH
BASIC: CHR$(27);"*";CHR$(m);CHR$(n1);CHR$(n2);
CHR$(v1);...;CHR$(vn);

ESC ? s n

Reassign Graphics Mode: Reassigns the dot density to the graphics mode specified by ESC K, ESC L, ESC Y, or ESC Z.

s=K, L, Y, or Z
n=dot density (see values below)

n	Horizontal dpi	Vertical dpi
0	60	72
1	120	72
2	120	72
3	240	72
4	80 (120)	72
5	72 (60)	72
6	90 (120)	72
7	144 (120)	72

NOTE
The emulation converts the values corresponding to n4 through n7 to the ones shown in parenthesis.

Example:

Normally, when the printer receives the ESC L command, the dot density is 120 dpi x 72 dpi vertical. By using this command, you can reassign that density to 60 dpi horizontal x 72 dpi vertical by sending the following:

CHR$(27);"?";"I";CHR$(0);

After the command is sent, the ESC L command then causes the horizontal density to be 60 dpi instead of 120 dpi.

Decimal: 27 63 n
Hex: 1B 3F nH
BASIC: CHR$(27);"?";CHR$(s);CHR$(n);

ESC ^ m n1 n2 **Select 9-Pin Graphics:** Turns on the 9-bit graphics mode for n1+(n2 x 256) columns. The variable m determines the density as follows:

NOTE
This emulation does not support the 9-bit operation. The byte containing the 9th bit is discarded and only the top eight bits are used.

m=1 double density
m=0 single density

Decimal: 27 94 m n1 n2
Hex: 1B 5E m n1 n2
BASIC: CHR$(27);"^";CHR$(m);CHR$(nl);CHR$(n2);

CHAPTER 7. DEC LG / COMPAQ LG PLUS EMULATION

CONTROL CODE DEFINITIONS

The control codes are single character action codes in the range 0 - 31 decimal in the ASCII code chart. The following are those codes, which are relevant to this emulation.

BEL

Bell: The printer's audible alarm will sound for 1/2 second when the bell code is received by the printer.

Decimal: 7
Hex: 07H
BASIC: CHR$(7);

BS

Backspace (08H): The backspace code will set the active print position one character position to the left at the current CPI, unless the new location precedes the left margin. In this case, the active position will be set to the left margin.

Indeterminate conditions: If the right margin has been exceeded the backspace is ignored.

Decimal: 8
Hex: 08H
BASIC: CHR$(8);

HT

Horizontal Tab: HT will set the active print position to the next horizontal tab position.

Indeterminate conditions: If there are tab(s) set but no tab(s) are set between the active print position and the right margin, the active print position will advance to the right margin.

If there are no tabs set, the active print position will advance to the right margin.

Decimal: 9
Hex: 09H
BASIC: CHR$(9);

NOTE
The emulation initially sets a horizontal tab stop every eight characters.

LF

Line Feed (0AH): Line terminator. LF will advance the active print position to the next line. If the enabled via the menu, the printer will execute a carriage return prior to executing the LF.

Decimal: 10
Hex: 0AH
BASIC: CHR$(10);

VT **Vertical Tab:** Line terminator. The active print position will be set to the next vertical tab stop.

Indeterminate Conditions
If there are no vertical tabs set, the active position will be advanced to the bottom margin. If there are no more tabs set between the current position and the bottom margin the active position will be set to the top margin on the next form.

NOTE
The emulation initially sets a vertical tab stop for every line on the page.

Decimal: 11
Hex: 0BH
BASIC: CHR$(11);

FF **Form Feed:** Line terminator. The active print position will be set to the top margin of the next form If the appropriate printer control switch is set, the printer will execute a carriage return immediately prior to executing the form feed.

Decimal: 12
Hex: 0CH
BASIC: CHR$(12);

CR **Carriage Return:** Line terminator. CR will return the active print position to the left margin. If the enabled by menu selection, the printer will execute a line feed immediately after executing the CR.

Decimal: 13
Hex: 0DH
BASIC: CHR$(13);

SO **Shift Out:** Shift Out locks character set G1 into GL.

Decimal: 14
Hex: 0EH
BASIC: CHR$(14);

SI **Shift In:** Shift In locks character set G0 into GL.

Decimal: 15
Hex: 0FH
BASIC: CHR$(15);

DC1 **Device Control 1:** Serial interface only: If READY/BUSY controlled by DC1/DC3 has been enabled via the printer configuration menu, the printer will transmit DC1 when its receive buffer reaches the low trip point.

Indeterminate Conditions
DC1 applies to the serial interface only. It is ignored if DC1/DC3 READY/BUSY is not enabled.

Decimal: 17
Hex: 11H
BASIC: CHR$(17)

DC3

Device Control 3: DC3 applies to the serial interface only. If READY/BUSY by DC1/DC3 has been enabled via the printer configuration menu, the printer will transmit a DC3 when its receive buffer reaches the high trip point.

Indeterminate Conditions
DC3 is ignored if DC1/DC3 READY/BUSY is not enabled.

Decimal: 19
Hex: 13H
BASIC: CHR$(19);

CAN

Cancel: CAN immediately ends an escape or control sequence. The printer interprets the characters following CAN as normal text. CAN also cancels a Device Control String when received within the command string of that DCS.

Decimal: 24
Hex: 18H
BASIC: CHR$(24);

SUB

Substitute: Sub immediately ends an escape or control sequence.

Indeterminate Conditions
Sub prints as a space character for sixel graphics data.

Decimal: 26
Hex: 1AH
BASIC: CHR$(26);

ESC

Escape: ESC introduces an escape or control sequence.

Indeterminate Conditions
If ESC is received in the middle of a sequence, the sequence is immediately ended and a new sequence is started. ESC also immediately ends a Device Control String.

Decimal: 27
Hex: 1BH
BASIC: CHR$(27);

COMMANDS

The control sequence introducer (CSI) signals the beginning of an ANSI control sequence that may accept parameters. In the 7-bit environment, ESC [is used. In the 8-bit environment, either ESC [or the single code 9B may be used. 8-bit control is menu selectable.

When the printer recognizes that the escape sequence is invalid or is not implemented, it will discard the characters received up to that point. Subsequent printable codes will be printed.

In the 7-bit environment, an escape sequence is defined as a group of two or more characters, beginning with the ASCII code 1B (hexadecimal), which invokes a given printer function.

In the 8-bit environment, an escape sequence is defined as a single character code which has its most significant bit set, or a group of two or more characters beginning with the ASCII code 9B (hexadecimal). When the parallel interface is used, the 8-bit environment is always available. For the serial interface, single character 8-bit controls are available if the interface has been set for eight data bits via the printer menu. For either interface, single character 8-bit controls must be enabled by menu selection.

Unless stated otherwise, any sequence received with illegal parameter(s) will be ignored, however, their use is discouraged as this may cause incompatibilities with future products.

IND

Index: IND moves the active position down to the same position on the next line.

Indeterminate Conditions
If the new position is below the bottom margin, the active position moves to the top of the next page.

Decimal:	27 68 or 132
Hex:	1B 44 or 84
BASIC:	CHR$(27);CHR$(68) or CHR$(132);

NEL

Next Line: NEL moves the active position to the left margin on the next line.

Indeterminate Conditions
If the new position is below the bottom margin, the active position moves to the top of the next page.

Decimal:	27 69 or 133
Hex:	1B 45 or 85
BASIC:	CHR$(27);CHR$(69) or CHR$(133);

HTS **Horizontal Tab Set:** A horizontal tab will be set at the current print position.

Indeterminate Conditions
If the maximum number of stops (32) is already set when a new one is programmed, the new one will be inserted and the rightmost tab stop removed.

Decimal: 27 72 or 136
Hex: 1B 48 or 88
BASIC: CHR$(27);CHR$(72); or CHR$(136);

VTS **Vertical Tab Set:** A vertical tab will be set at the current vertical position.

Indeterminate Conditions
If there is an attempt to set more than the maximum number of tab stops allowed, only the stops nearest the top of sheet are retained. Stops that have been set for forms longer in length than the currently programmed form are not usable. Resetting the forms length to include those stops will cause the stops to again become active.

Decimal: 27 74 or 138
Hex: 1B 4A or 8A
BASIC: CHR$(27);CHR$(74);

PLD **Partial Line Down:** The active vertical position will move downward by one half of the current line feed distance to create an appearance of subscripting. The ESC K sequence is also used to effect recovery to the original active vertical position following an ESC L (partial line up sequence) code sequence.

Indeterminate conditions
If the command exceeds the bottom of form position, the command will be ignored.

Decimal: 27 76 or 139
Hex: 1B 4B or 8B
BASIC: CHR$(27);"K";

PLU **Partial Line Up (1B 4C or 8CH):** The active vertical position will move upward by one half of the current line feed distance to create an appearance of superscripting. (See ESC K above). The ESC L sequence is also used to effect recovery to the original active vertical position following the ESC K (partial line down sequence) code sequence.

Indeterminate Conditions
If the command exceeds the top of form position, the command will be ignored.

Decimal: 27 77 or 140
Hex: 1B 4C or 8C
BASIC: CHR$(27);CHR$(77); or CHR$(140);

RI **Reverse Index:** Moves the active line position up to the same position on the preceding line. The Reverse Index command causes the active position to stop at the top of the margin.

Decimal: 27 78 or 141
Hex: 1B 4D or 8D
BASIC: CHR$(27);CHR$(78); or CHR$(141);

SS2 **Single Shift 2:** Temporarily moves character set G2 into GL to print one character.

Decimal: 27 69 or 142
Hex: 1B 4E or 8E
BASIC: CHR$(27);"N"

SS3 **Single Shift 3**: Temporarily moves character set G3 into GL to print one character.

Decimal: 27 70
Hex: 1B 4F or 8F
BASIC: CHR$(27);"O"; or CHR$(143);

DCS **Device Control String**: Introduces a device control string.

Indeterminate Conditions
A DCS control character received in an escape sequence, control sequence, or control string aborts the sequence and begins a new device control string.

Decimal: 27 80 or 144
Hex: 1B 50 or 90
BASIC: CHR$(27);"P"; or CHR$(144);

CSI **Control String Introducer**: Introduces a sequence of one or more bytes that constitute a control function.

Decimal: 27 91 or 155
Hex: 1B 5B or 9B
BASIC: CHR$(27);CHR$(91); or CHR$(155);

Indeterminate Conditions
A CSI control character received in an escape, control sequence, or control string aborts the sequence and begins a new device control string.

ST **String Terminator**: Indicates the end of a device control string (DCS).

Decimal: 27 92 or 156
Hex: 1B 5C or 9C
BASIC: CHR$(27);CHR$(92); or CHR$(156);

OSC

Operating System Command: OSC introduces an Operating System Command String. OSC control strings are ignored

Indeterminate Conditions
The start of this control string is recognized but all of the data that follows is ignored until this sequence is either aborted or terminated by an ST sequence.

Decimal: 27 93 or 157
Hex: 1B 5D or 9D
BASIC: CHR$(27);CHR$(93); or CHR$(157);

PM

Privacy Message: Introduces a Privacy Message control String. PM control strings are ignored.

Indeterminate Conditions
The start of this control string is recognized but all of the data that follows is ignored until this sequence is either aborted or terminated by an ST sequence.

Decimal: 27 94 or 158
Hex: 1B 5E or 9E
BASIC: CHR$(27);CHR$(94); or CHR$158);

APC

Application Program Command: APC introduces an Application Program Command String. APC control strings are ignored

Indeterminate Conditions
The start of this control string is recognized but all of the data that follows is ignored until this sequence is either aborted or terminated by an ST sequence.

Decimal: 27 95 or 159
Hex: 1B 5F or 9F
BASIC: CHR$(27);CHR$(9F); or CHR$(159);

DECIPEM

IBM Proprinter Emulation Mode: Selects the Proprinter emulation.

Decimal: 155 63 53 56 104
Hex: 9B 3F 35 38 68
BASIC: CHR$(155);"?";"5";"8";"h";

SGR (n1)(n2)... m **Select Graphics Rendition**: This sequence will select the Font (mode and character style) by using one or more of the following parameters:

0	Normal Printing Mode (Default)
1	Bold Print Mode
4	Underline Mode
10	Default (Data Processing)
11	Correspondence
12	OCR-A
13	OCR-B
14	Data Processing
15	High speed draft
16	Data Processing
17	Correspondence
18	Data Processing
19	Near Letter Quality
21	Double Underline Mode (uses normal underline mode)
22	Cancel Bold Mode
24	Cancel Underline Mode
53	Overscore mode
55	Cancel overscore

Decimal: 155 n1 n2 ... m
Hex: 9B n1H h2H ... 6D
BASIC: CHR$(155);CHR$(n1);CHR$(n2);...;"m";

DECRLGS **Request Logo Status**: This command applies to the serial interface only. It requests a status report of the logos available for printing.

The logo string contains a list of all the valid logos loaded in the printer and their comment strings. Each logo number and comment start on a new line, separated by commas.

Decimal: 155 23 112
Hex: 9B 27 70
BASIC: CHR$(155);CHR$(23);CHR$(112);

Reply: DCS &w (logo #) (string) ST
90 26 77 (logo #) (string) 9C

NOTE
This command works only when the printer is connected to the host through the serial interface.

DECRFS

Request Font Status: Requests a status report of the fonts available for printing, the memory available for loading forms and logos, or both.

The Ps parameters are defined as:

0 Send both reports (default)
1 Send status of ROM fonts
2 Send amount of RAM available for forms and logos.

Discussion: The reply to a DECRFS with a Ps parameter of 1 will not contain an ID string in this implementation. The nnn within the reply to a DECRFS with a Ps parameter of 2 represents decimal number indicating the number of bytes of RAM available for storing forms and logos.

Replies:

Reply with Ps = 1: <DCS>1"{ <ST>
90 31 22 7B 9C

Reply with Ps = 2: <DCS>2"(nnn) <ST>
90 32 22 (nnn) 9C

Reply with Ps = 0: <DCS>1"{ <ST><DCS>2"(nnn) <ST>
90 31 22 7B 9C 90 32 22 (nnn) 9C

Decimal: 155 Ps 59 Ps 34 123
Hex: 9B PsH 3B PsH 22 7B
BASIC: CHR$(155);CHR$(Ps);CHR$(59);CHR$(Ps);CHR$(34);
CHR$(123);

NOTE

This command works only when the printer is connected to the host through the serial interface.

DECDLG **Delete Logo Sequence:** Delete logo from printer memory. P1 defines the logos to be deleted.

Indeterminate Conditions

When P1 = 0, P2 through Pn make up the ID of the logos to be deleted.

When P1 = 3, All stored logos are deleted.

Deleting a logo within a form is not allowed.

Decimal: 155 P1 59 P2 59 ... Pn 59 38 124
Hex: 9B P1H 3B P2H 3B ... PnH 3B 26 7C
BASIC: CHR$(155);CHR$(P1);CHR$(59);CHR$(P2);CHR$(59);
...;CHR$(Pn);CHR$(59);"&|";

DECILG **Select Logo Sequence:** Prints the selected logo contained in printer memory. ***Pn*** defines the ID of the selected logo.

Indeterminate Conditions

If no logo exists for the ID specified, the sequence is ignored.

At the end of a select logo sequence, the cursor remains in the starting position.

Decimal: 155 Pn 38 125
Hex: 9B PnH 26 7D
BASIC: CHR$(155);CHR$(Pn);"&}";

DECLFM

Loading Forms Sequence: Allows forms to be loaded and stored into printer memory.

General Command Syntax
DCS P1;P2&p record ST

P1 specifies the form file format. **(must be 0)**
P1 = 0 LG-series printer logo file format.
P1 ≠ 0 Sequence is ignored.

P2 defines the replacement action.
P2 = 0 Replace the named form.
P2 = 3 Replace all forms.

Record
The record includes the form header that defines form parameters and size, and the form data string.

ID Length = Two digit number (01 through 99) that defines the length of the form ID.

Form ID =String of one to 99 printable characters that identify the form.

CNTL Encoding Character = Indicates the start of control-character encoding. The character is always in the range of 20 through 7E hex, and is followed by a two-digit hexadecimal number equivalent to the ASCII value of the control character to be encoded. When a control character is required within the form data, the control character must be entered in its hexadecimal format and preceded by the CNTL encoding character.

Form Data Switch Character = Designates the insertion of the form's fill-in data. The character is always in the range from 20 through 7E hex. The form-data switch character must be different from the control-character encoding character. The form data switch character is not printable within the form and should not be used in any control sequence in the form.

Form Length = A five-digit number, 00001 through 65,535, that defines the length of the string that follows. The string count includes all characters other than uncoded control characters 0 through 1F hex.

Form Data String = Form data is a string of text and command sequences with encoded control characters. Terminate the string with a **ST (ESC \ or decimal 156)** command.

DECFLM **(continued)**

Sample DECFLM Sequence
ESC P 0 ; 3 & p **04Memo%@00234** ESC \

Decimal: 144 **P1** 59 **P2** 38 112 **record** 156
Hex: 90 **P1** 3B **P2** 26 70 **record** 9C
BASIC: CHR$(144);CHR$(P1);CHR$(59);CHR$(P2);"&p";
record;CHR$(156);

NOTE
The forms remain selectable until new forms are loaded using the replace all command, another form with the same number is loaded, or if the printer power is turned off.

DECDFM **Delete Forms Sequence:** Deletes forms from printer memory.

General Command Syntax
DCS **Ps** & q **forms id** ST

Ps = 0 Delete form that matches the forms id string.
Ps = 3 Delete all stored forms.

Indeterminate Conditions
The FORM ID string identifies the forms to be deleted. If more than one Form ID is listed, separate them with semicolons. Form Ids with more than ten characters are ignored.

If you try to delete a form while it is printing, the printer will ignore the delete command.

Decimal: 144 **Ps** 38 113 FORMS ID 156
Hex: 90 PsH 26 71 FORMS ID 9C
BASIC: CHR$(144);CHR$(ps);"Sq";forms id;CHR$(156);

DECIFM

Start Forms Sequence: Selects any form loaded in the printer's RAM. When a form is selected, the printer enters Form Mode and variable 'fill-in' data is merged and printed with the form data.

General Command Syntax
DCS ***P1*** & r **FORM NAME** ST

Indeterminate Conditions
P1 is the select form switch character. The select form switch character always ranges from 20 hex through 7E hex and designates the printer to switch back to form data. When the printer encounters a FF character in the form data portion of a multiple page form, it advances to the next page and continues merging with the fill-in data that follows. If there is more than one set of fill-in data, the same form constant data is merged with the new fill-in data to create additional forms.

The **FORM NAME** is the first ten characters of the loaded form's ID (or the full form ID if it is ten characters or less in length). If no such form exists, the fill-in data is printed as text data.

Decimal: 144 P1 38 114 FORM NAME 156
Hex: 90 ***P1H*** 26 72 **FORM NAME** 9C
BASIC: CHR$(144);P1;"&r";"FORM NAME";CHR$(156);

NOTE
The text and command strings corresponding to the last field of a multi-page form page must terminate with a switch character. The last field in the last page of a form must terminate with the Stop Form sequence and not with the switch character. To exit the FORM Mode, enter a Terminate sequence.

SIXEL Sixel Graphics: This sequence provides a group of 6 bit bytes to be used as vertical graphics data. A bit value of 1 means print a pixel, while a bit value of 0 means leave a blank. The Device Control String (DCS) envelope contains the graphics introducer and all graphics data. This envelope is initiated using the DCS control character and is terminated with the String Terminator (ST) control character. The Sixel protocol components are made up of the String Introducer, Protocol Selector, Picture Data, and String Terminator. The Protocol Selector consists of a string of 0, 1 or more numeric parameters separated by the semicolon character (3BH).

The overall command format is the following:

DCS ***Ps1***;***Ps2***;***Ps3*** … ***Psn*** q **Sixel data** ST

The Protocol Selector is that portion of the form:

Ps1;***Ps2***;***Pn3*** … ***Pn*** q.

Hex: 90 ***Ps1*** 3B ***Ps2*** 3B ***Pn3*** … ***Pn*** q <sixel data> 9C

Ps1 selects the horizontal grid size and aspect ratio, this will implicitly define the vertical grid size. The following table defines the parameter selections.

Ps1	Horizontal DPI	Vertical DPI	Aspect Ratio
0	100	50	200:100
1	100	50	200:100
2	200	50	400:100
3	200	65	300:100
4	100	40	250:100
5	100	50	200:100
6	67	45	150:100
7	67	55	120:100
8	50	45	110:100
9	50	50	100:100

Ps2 is the background select parameter. It is not used by this printer.

Ps3 selects the horizontal grid size in decipoints. This parameter, used with the aspect ratio, defines grid size. The following table identifies the horizontal grid size used for each parameter value.

Ps3	Horizontal DPI
0	No Change
1	240
2	240
3	240
4	180
5	140
6	120
7	120
8	90
9	90
10	70
11-19	60

DECLLG

Loading Logo Sequence: A graphic image is downloaded and stored in printer memory.

General Command Syntax
DCS **P1 P2** & t **record** ST

P1 specifies the logo file format. (must be 0)
P1 = 0 LG-series printer logo file format.

P2 lists the logos to be deleted.
P2 = 0 Delete all logos.
P2 = n Delete any logo with the same Logo ID (n).

Record
The record includes the logo header and the graphic row records used to print the image.

ID Length = One digit number (1 through 4) that defines the length of the logo ID.

Logo ID = String of one to four numerals that identify the logo.

Comment Length = One digit number (0 through 7) that defines the length of the comment field.

Logo Length = A five digit number (00001 through 65535) that defines the length of the logo record.

Row Records = R;S;N1;N2;...\
R = Height of the segment in mils.
S = Row starting color. (0=white, 1=black)
N1: N2 = Length of segment in mils.
\ = Row terminator.

Indeterminate Conditions
Logos can be loaded at any time except during another download operation and during a form printing operation. When loaded, they are available until they are replaced, deleted, or the printer power is turned off.

The start row color, defined within the Row Record, will switch with each subsequent segment printed.

Decimal: 144 ***P1*** 59 ***P2*** 38 116 ***record*** 156
Hex: 90 ***P1H*** 3B ***P2H*** 26 74 ***record*** 9C
BASIC: CHR$(144);***P1***;CHR$(59);***P2***;"&t";"***recor***d";CHR$(156);

NOTE
The logo length includes all characters other than C0 control characters (0 through 1F hex).

DECAUPSS

Assign User Preference Supplemental Set: Assigns several of the ISO and special character sets to the User Preference Supplemental Set. The following table lists the UPS Character Sets.

General Command Syntax
DCS **Ps** ! u **D ... D** ST

UPS Character Sets

Character Set	Ps	D...D
DEC Supplemental	0	%5
ISO Latin-1 Supplemental	1	A
ISO Latin-Hebrew Supplemental	1	H
DEC Technical	0	>
ISO Latin-Greek Supplemental	1	F
ISO Latin-9 Supplemental	1	b

Decimal: 144 **Ps** ! u **D ... D** ST
Hex : 90 ***Ps*** 21 75 ***D...D*** 9C
BASIC: CHR$(144);Ps;"!u";"D...D";CHR$(156);

NOTE
If values for Ps and D...D are selected other than those in the table above, this command will be ignored.

DECBARC

Start Bar Coding: Generates bar codes using data that follows the sequence. Bar code parameters are defined by the last DECSBCA sequence. The printer continues to encode bar codes until it receives the Stop Bar Code sequence.

General Command Syntax
ESC % SP 0

Indeterminate Conditions
Bar codes that extend beyond the margins are truncated.

Decimal: 27 37 32 48
Hex: 1B 25 20 30
BASIC: CHR$(27);"% 0";

DECTFM **Terminate Forms Sequence:** Terminates the printing of a form.

General Command Syntax
ESC # SP 1”

Indeterminate Conditions
If no form is selected, this sequence is ignored. Many special conditions might affect the printer output see the note below for further information.

Decimal:	27 19 32 49
Hex:	1B 23 20 31
BASIC:	CHR$(27);”# 1”;

Notes
The following commands are not to be included in the form data or fill-in data:

- Load a form or logo
- Delete a form or logo
- Invoke a Digital sequence
- Invoke an ESC sequence. This will exit you from the Form Mode.

The following conditions will affect the output or performance:

- Encoded escape cannot start in the form and continue in the fill-in data, nor can the reverse occur.
- Changes mode to the font, cursor position, density, or mode are not restored after you terminate a Form Sequence.
- Block characters used in a form must begin and end on the same page.
- Since mode settings, fonts, and spacing parameters can be changed between the time the form is loaded and the item is selected, the environment of the form (PUM or SSU) should be established in the form data.
- If ESC, CAN, or SUB is embedded in the form string, it will terminate form loading and the form will be discarded. Encoding DCS, RIS, CAN, or SUB in a form string will also stop form loading.
- If the form length in the header does not agree with the length of the form string received, the form is discarded. If the form is not terminated by a Form Feed, and does not contain at least one form-switch character, a form-switch character and a Form Feed will be added at the end of the form.
- In general, the number of switch characters in the form data should be one more than the number of switch characters in the fill-in data.

When using bar codes, note the following:

- When using bar codes as part of the form data, make sure that the control character encoding character in the bar code differs from the control character encoding character in the Loading Form sequence.

- When using bar codes as part of the fill-in data, make sure that the control character encoding character of the bar code differs from the switch character in the Select Form sequence.
- Bar codes must start and end on the same page of a form.

DECBLOCKC

Start Block Character Mode: Generates the block characters from the characters that follow the sequence.

General Command Syntax
ESC % SP 1

Indeterminate Conditions
The block characters inherit the last set of parameters defined. If no prior sequence exists, the block characters are printed with:

- 0 degree rotation
- The U.S. ASCII character set
- With a horizontal and vertical magnification factor of 2
- With a white background

Decimal: 27 37 32 49
Hex: 1B 25 20 31
BASIC: CHR$(27);"% 1";

SOCS (Epson)

Select Other Coding System: Selects the Epson FX emulation.

General Command Syntax
ESC % SP 2

Decimal: 27 37 32 48
Hex: 1B 25 20 32
BASIC: CHR$(27);"% 2";

S7C1R

Select 7-Bit Code: In a 7-bit environment, this sequence allows receipt of 7-bit control strings only.

General Command Syntax
ESC SP 6

Indeterminate Conditions
For all subsequent characters, the printer processes received 2-character sequences as defined in the C0 control chart. If 8-bit C1 control characters are received, it drops the eighth bit and processes the character as a C0 character.

Decimal: 27 32 54
Hex: 1B 20 36
BASIC: CHR$(27);" 6";

S8C1R

Select 8-Bit Code: In an 8-bit environment, this sequence allows receipt of 8-bit control strings.

General Command Syntax
ESC SP 7

Indeterminate Conditions
For all subsequent characters, the printer processes received 2-character sequences as defined in the C0 control chart and 8-bit control characters as defined in the C1 control chart.

Decimal: 27 32 55
Hex: 1B 20 37
BASIC: CHR$(27);" 7";

SOCS (Proprinter)

Select Other Coding System: Selects the Proprinter emulation.

General Command Syntax
ESC % =

Decimal: 27 37 61
Hex: 1B 25 3D
BASIC: CHR$(27);"%=";

ROCS

Stop Bar Coding (Return from Other Coding System): Stops bar code printing. Once bar coding is stopped, the font selection and associated attributes are restored to the conditions prevailing prior to bar code printing.

General Command Syntax
ESC % @

Decimal: 27 37 64
Hex: 1B 25 40
BASIC: CHR$(27);"%@";

CUU

Cursor Up: Causes the active print position to move to the corresponding column at the preceding vertical position set by the Pn value. Pn is the number of lines that the active line moves up at the current active column. Default value Pn = 1.

General Command Syntax
ESC [Pn A

Indeterminate Conditions
If you try to move the active position above the top line, the active position stops at the top line.

Decimal: 27 91 ***Pn*** 65
Hex : 1B 5B ***PnH*** 41
BASIC: CHR$(27);"[";***Pn***;"A";

GSM

Graphic Size Modification: This sequence will change the height and/or width of graphic characters. The first and second parameters are the percentages by which the height and width respectively will be multiplied. The default value for both p1 and p2 is 100 percent.

General Command Syntax
ESC [**Pn1;Pn2** SP B

Decimal: 27 91 ***Pn1*** 59 ***Pn2*** 32 50
Hex : 1B 5B ***Pn1*** 3B ***Pn2*** 20 42
BASIC: CHR$(27);"[";**Pn1**;";";**Pn2**;" B";

NOTE
Pn1 is a decimal value that specifies the height of the font as a percentage of the height set by the GSS sequence. Pn2 is a decimal value that specifies the width as a percentage of the width set by the GSS sequence. Fonts can be modified by two or three times their default height and two times their default width.

GSS

Graphic Size Selection: Sets the height and width of all characters that start after the control sequence.

General Command Syntax
ESC [Pn SP C

Decimal: 27 91 ***Pn*** 32 77
Hex: 1B 5B ***Pn*** 20 43
BASIC: CHR$(27);"[";**Pn**;" C";

NOTE
Pn is a decimal value that species the height of the font in units determined by the Select Size Unit (SUU) sequence. The width of the font is implicitly defined by the height. The default value for Pn is 100. The GSS sequence remains in effect until the printer receives another GSS sequence or a Graphic Size Modification (GSM) sequence.

S7C1T

Select 7-Bit C1 Transmission: This sequence causes the printer to use 7-bit encoding for all C1 control characters transmitted. All C1 characters are then represented as two-character ESC sequences.

General Command Syntax
ESC SP F

Decimal: 27 32 70
Hex: 1B 20 46
BASIC: CHR$(27);" F";

S8C1T

Select 8-Bit C1 Transmission: This sequence causes the printer to use 8-bit encoding for all C1 control characters transmitted. All C1 characters are then represented as one-character CSI sequences.

General Command Syntax
ESC SP G

Decimal: 27 32 71
Hex: 1B 20 47
BASIC: CHR$(27);" G";

SPI

Spacing Pitch Increment: This sequence will set the spacing between lines (p1) and the horizontal character pitch (p2). p1 and p2 are given in decipoints or pixels dependent on the units selected by the Select Size Unit (SSU) sequence.

General Command Syntax
ESC [Pn1;Pn2 SP G

Indeterminate Conditions
A vertical spacing value, which exceeds the current form length, will be ignored. If the parameter value is omitted, the current setting will not be changed.

5000 Specific
The LPI parameter may range from 1 to 17280 decipoints (24 inches) but must be less than or equal to the printable area of the form. The printable area is defined as the area between the top and bottom margins. The range of values for CPI is dependent on the font selected. The actual achieved spacing, on the average, will match the requested spacing. Values outside of the permissible range for a font are ignored. An omitted or zero parameter leaves the current setting unchanged.

Decimal: 27 91 ***Pn1*** 59 ***Pn2*** 32 71
Hex: 1B 5B ***Pn1*** 3B ***Pn2*** 20 47
BASIC: CHR$(27);"[";***Pn1***;";";***Pn2***;" G";

SSU

Select Size Unit: When PUM is set, Select Size Unit selects either decipoints or pixels as the spacing unit, depending on the parameter settings defined below.

If the printer receives an SSU while PUM is reset, the selected unit will take effect when PUM is set and will then remain in effect until the printer receives another SSU or a reset sequence. Default value at power-up or reset is decipoints. The printer will ignore all Ps values other than 2 or 7.

General Command Syntax
ESC [Ps SP I

Decimal: 27 91 ***Ps*** 32 73
Hex: 1B 5B ***Ps*** 20 49
BASIC: CHR$(27);"[";***Ps***;" I";

Ps	Spacing Unit
2	Decipoint (1/720 inch)
7	Pixel (1/600 inch)

SHS

Select Horizontal Spacing: Ps selects the horizontal pitch.

General Command Syntax
ESC [Ps SP K

Ps	Horizontal Pitch
0	10 characters per inch
1	12 characters per inch
2	15 characters per inch
3	6 characters per inch

Decimal: 27 91 ***Ps*** 32 75
Hex: 1B 5B ***Ps*** 20 4B
BASIC: CHR$(27);"[";***Ps***;" K";

SVS

Select Vertical Spacing: Ps selects the vertical spacing between lines that is used by all fonts.

General Command Syntax
ESC [Ps SP L

Ps	Vertical Pitch
0	6 lines per inch
1	4 lines per inch
2	3 lines per inch
3	12 lines per inch
4	8 lines per inch
5	5 lines per 30 inches
9	2 lines per inch
1	10 lines per inch

Decimal: 27 91 ***Ps*** 32 76
Hex: 1B 5B ***Ps*** 20 4C
BASIC: CHR$(27);"[";***Ps***;" L";

HPA

Horizontal Position Absolute: The active print position will be moved to the location specified by p1.

General Command Syntax
ESC [Pn `

Indeterminate Conditions
If the new horizontal position is greater than the carriage width, then the horizontal position of the control sequence will be ignored and the current horizontal position will not change. If the parameter is omitted or zero, left edge will be assumed.

Decimal: 27 91 ***Pn*** 96
Hex: 1B 5B ***Pn*** 60
BASIC: CHR$(27);"[";***Pn***;"`";

NOTE
If the new position exceeds the right margin but is less than the physical width, move to the right margin.

HPR

Horizontal Position Relative: This sequence will move the active print position to the right, relative to the current position. Parameter p1 specifies the number of units to move. HPR cannot be used to move beyond the right margin.

General Command Syntax
ESC [Pn a

Indeterminate Conditions
Parameters greater than the physical print width will cause a default to the right margin, unless the "auto-wrap" printer control switch is set. If set, the active print position will move to the left margin. If the parameter is omitted or zero, one decipoints will be assumed.

Decimal: 27 91 Pn 73
Hex: 1B 5B Pn 61
BASIC: CHR$(27);"[";Pn;"a";

RIS

Reset to Initial State: Resets the value or state of several operating features. This sequence resets the printer to a set of operating values and conditions similar to the factory default settings (see table below).

General Command Syntax
ESC c

Decimal: 27 75
Hex : 1B 63
BASIC: CHR$(27);"c";

NOTE
This sequence and the DECSTR reset sequence have the same function.

Selectable Parameter	Reset Condition
Printing Status	On-line
Horizontal Pitch	10 characters per inch
Vertical Pitch	6 lines per inch
Font	Data Processing
Forms Length	66 lines (11 inches)
Active position	Column 1 on the current line
Top Margin	Line 1
Bottom Margin	Line 66
Left Margin	Column 1
Right Margin	Column 136
Underlining	Disabled
Bolding	Disabled
Italics	Disabled
Double Underline	Disabled
Overline	Disabled
Expansion	No character expansion
GL Character Set	US ASCII
GR Character Set	Digital Supplemental
G0	US ASCII
G1	VT100 Graphic Character Set
G2	Digital Supplemental
G3	US ASCII
Autowrap	Disabled
Line Feed/New Line Mode	Reset
Horizontal Tabs	Every 8 columns (9,17 ...)
Unsolicited Reports	Disabled
Super/Subscripts	Disabled
Carriage Return/New line	Reset
Vertical Tabs	Every line (1-66)

DA

Product Identification: Shows the product identification. When the host sends a device attributes sequence, the printer responds with a sequence that identifies the printer. The response is ESC[?45c.

General Command Syntax

ESC [c or ESC [0 c

Decimal: 27 59 75 or 27 59 48 75
Hex: 1B 5B 63 or 1B 5B 30 63
BASIC: CHR$(27);"[0c";

VPA

Vertical Position Absolute: The current vertical position will be set to the value specified. The horizontal position will not change. VPA may be used to print within the top and bottom margins.

General Command Syntax

ESC [***Pn*** d

Indeterminate Conditions

If the new vertical position is greater than the forms length, then the sequence will be ignored. If p1 is omitted or zero, Pn is interpreted as the default value of 1.

Decimal: 27 59 ***Pn*** 76
Hex : 1B 5B ***Pn*** 64
BASIC: CHR$(27);"[";***Pn***;"d";

VPR

Vertical Position Relative: The current vertical position will be advanced by the distance specified by the command parameter. If the move would be beyond the bottom line, the active position stops at the bottom line.

General Command Syntax

ESC [***Pn*** e

Indeterminate Conditions

If the parameter is omitted or zero, Pn is interpreted as the default value of 1.

Decimal: 27 59 Pn 77
Hex: 1B 5B *Pn* 65
BASIC: CHR$(27);"[";Pn;"e";

TBC

Tab Clear: This sequence will clear horizontal or vertical tab (or tabs) based on the parameter. If no parameter is present, the default will be to clear the horizontal tab at the current position, if one exists. The valid parameters are as follows:

General Command Syntax
ESC [***Ps*** g

Ps	Tab Clear Action
0	Clear horizontal tab at current position (Default)
1	Clear vertical tab at current position
2 or 3	Clear all horizontal tabs
4	Clear all vertical tabs

Indeterminate conditions
Other Values are reserved.

Decimal: 27 91 ***Ps*** 79
Hex : 1B 5B ***Ps*** 67
BASIC: CHR$(27);"[";***Ps***;"g";

SM

Set Mode: This sequence will set the mode(s) indicated by one or more parameters. Parameter values are either ANSI or Digital private. Digital private parameters are preceded by the question mark character.

ANSI Defined Parameter Values

Ps	Mode Mnemonic	Mode Function
11	PUM	Position Unit Mode
20	LNM	Linefeed New Line Mode

DEC Private Parameter Values

Ps	Mode Mnemonic	Mode Function
?7	DECAWM	Autowrap Mode
?29	DECPSM	Pitch Select Mode
?40	DECCRNLM	Carriage Return/New Line Mode

The meanings for these follows:

PUM

Position Unit Mode: Selects a unit of measurement used with the escape sequences that control spacing parameters. When Position Unit Mode is enabled, it selects either decipoints or pixels, depending on the setting of the Select Size Unit sequence. When Position Unit Mode is disabled, it selects a spacing unit equal to one character position. The power-up default is PUM reset.

LNM

Linefeed New Line Mode: In the set state, LNM will cause a received linefeed character to imply a new line, or carriage return. In the reset state, a linefeed will provide vertical motion only, with no change in the print position. The Default State of LNM is established by menu selection.

DECAWM **Autowrap Mode:** Determines what happens when text exceeds the right margin. When autowrap is enabled and text exceeds the right margin, the active print position moves to the left margin on the next line. When autowrap is disabled and text exceeds the right margin, data will be lost.

DECPSM **Pitch Select Mode:** Controls the Set Horizontal Pitch (DECSHORP) sequence. When Pitch Select Mode is enabled, the current font determines the pitch. When disabled, the printer uses the horizontal pitch selected by the DECSHORP sequence.

DECCRNLM **Carriage Return / New Line Mode:** Defines the response to the Carriage Return character. When Carriage Return New Line Mode is enabled, a received Carriage Return will return the active position to the left margin on the next line. When disabled, a Carriage Return will return the active position to the left margin on the current line.

VFU **Load Vertical Format Unit:** This sequence will download the VFU from the host. All data following this load sequence is placed into the VFU memory until terminated with the End Load sequence. Any command entered during the load is ignored except the End Load sequence. All data must be in the VFU load format. If an error is detected during the load, the load is aborted. If a load exceeds the form length, the load is aborted. Cancelled loads default to the current form length setting.

General Command Syntax
ESC [< 1 h

The VFU load format consists of two bytes for each line on the page.

First Byte

Bits	7	6	5	4	3	2	1	0
Values	Not Used	Always 1	Channel 6	Channel 5	Channel 4	Channel 3	Channel 2	Channel 1

Second byte

Bits	7	6	5	4	3	2	1	0
Values	Not Used	Always 1	Channel 12	Channel 11	Channel 10	Channel 9	Channel 8	Channel 7

Channel 1: Identifies the Top Of Form.
Channel 12 Identifies the Bottom Of Form.

Decimal: 27 91 60 49 80
Hex: 1B 5B 3C 31 68
BASIC: CHR$(27);"[<1h";

VFU

End Load Vertical Format Unit (End Load): This sequence will end the Vertical Format Unit load.

General Command Syntax

ESC [< 1 l <- Note lower case L as the last character.

Decimal: 27 59 60 49 84
Hex: 1B 5B 3C 31 6C
BASIC: CHR$(27);"[<1l";

VFU

Channel Command: This sequence will control paper motion. P1 consists of three digits nnn. When the first n equals 9, reverse paper motion occurs. If the first n equals any value other than 0 or 9, the entire sequence is ignored.

General Command Syntax

ESC [***P1*** & Y

The table of values of nnn follows:

P1 nnn	Move Forward to Channel	P1 nnn	Move Backward to Channel
000	1	900	1
001	2	901	2
002	3	902	3
003	4	903	4
004	5	904	5
005	6	905	6
006	7	906	7
007	8	907	8
008	9	908	9
009	10	909	10
010	11	910	11
011	12	911	12

Decimal: 27 59 ***P1*** 38 121
Hex : 1B 5B ***P1*** 26 79
BASIC: CHR$(27);"[";***P1***;"&Y";

Notes

Selecting any other channel than those defined in the above table will result in default to channel 12 (BOF).

If a channel is not defined and channel 12 is undefined, the move will be to the next line.

If the VFU table is not loaded and channel commands are sent to it, a line feed occurs.

HPB

Horizontal Position Backward: The current horizontal position will be changed, moving the active position in the backward direction by the specified amount. The movement is not permitted to cross the left margin of the current form.

General Command Syntax
ESC [Pn j

Indeterminate Conditions
If the parameter is omitted, or zero, Pn is interpreted as the default value of 1.

If a parameter should request a positioning change into the left margin region, the current position will be set to the left margin.

Decimal: 27 71 Pn 82
Hex: 1B 5B Pn 6A
BASIC: CHR$(27);"[";Pn;"j";

VPB

Vertical Position Backward: The current vertical position will be changed, moving the active position in the reverse direction by the specified amount. The movement is not permitted to cross the top margin of the current form.

General Command Syntax
ESC [***Pn*** k

Indeterminate Conditions
If the parameter is omitted, Pn is interpreted as the default value of 1.

If a parameter should request a positioning change into the top margin region, the current position will be set to the top margin.

Decimal: 27 71 ***Pn*** 83
Hex : 1B 5B ***Pn*** 6B
BASIC: CHR$(27);"[";***Pn***;"k";

RM

Reset Mode: Resets the mode indicated by one or more parameters. The parameters and meanings are the same as used by SM (Set Mode).

General Command Syntax
ESC [***Ps*** l <- last character is a lower case L

Decimal: 27 71 ***Ps*** 85
Hex : 1B 5B ***Ps*** 6C
BASIC: CHR$(27);"[";***Ps***;"l"

DSR

Device Status Requests: The host sends the Device Status Request listed below to request a printer status report.

General Command Syntax
ESC [***Ps*** n

Decimal: 27 71 ***Ps*** 86
Hex : 1B 5B ***Ps*** 6E
BASIC: CHR$(27);"[";Ps;"n";

DSR Sequences to Request Status

Request Sequence	Printer Response
<ESC>[0n or <ESC>[5n	Sends an extended status report
<ESC>[6n	Sends a cursor position report

The host sends the Device Status Request listed below to enable or disable unsolicited status reports.

DSR Sequences to Enable or Disable Unsolicited Reports

Request Sequence	Printer Response
<ESC>[?1n	Disables all unsolicited reports
<ESC>[?2n	Enable brief unsolicited status reports and sends an extended status report.
<ESC>[?3n	Enable extended, unsolicited status reports and sends an extended status report.

Responses: Cursor Position Report
<ESC>[Pn1;Pn2R
Pn1 is the active line
Pn2 is the active column

Brief Unsolicited Messages Enabled
<ESC>[Pn1n
Pn1 = 0 After an error condition has been corrected or no error exists.
Pn1 = 3 If an error is detected.

Extended Unsolicited Messages Enabled
<ESC>[?20n No error exists.
<ESC>[?Pn1;Pn2n A error is detected. (See following table)

Printer Status Error Codes

Pn1 Fault Code	Pn2 Fault Code	Printer Fault
27	206	Paper Out
25	0	Paper Jam
26	0	Cover Open
38	229	Ribbon Jam
36	220	Striker Bar Open
26	212	All Others

Notes

This option will work only if the printer's serial interface is active, and the RTS option on the host is set to true.

The units reported by the Cursor Position Report can be character positions, decipoints, or pixels dependent on the settings of PUM and SSU.

Emulation strap S1 enable/disables unsolicited error reports.

Emulation strap S2 selects brief or extended status reports.

DECSTR

Soft Terminal Reset: Resets the value or state of several operating features. After receiving a DECSTR, the printer positions itself at the next Top Of Form then resets the value or state of several operating features.

General Command Syntax
ESC [! p

Decimal: 27 71 17 84
Hex: 1B 5B 21 70
BASIC: CHR$(27);"[";"!p";

NOTE
This sequence and the RIS reset sequence have the same function.

Selectable Parameter	Reset Condition
Printing Status	On-line
Horizontal Pitch	10 characters per inch
Vertical Pitch	6 lines per inch
Font	Data Processing
Forms Length	66 lines (11 inches)
Active position	Column 1 on the current line
Top Margin	Line 1
Bottom Margin	Line 66
Left Margin	Column 1
Right Margin	Column 136
Underlining	Disabled
Bolding	Disabled
Italics	Disabled
Double Underline	Disabled
Overline	Disabled
Expansion	No character expansion
GL Character Set	US ASCII
GR Character Set	Digital Supplemental
G0	US ASCII
G1	VT100 Graphic Character Set
G2	Digital Supplemental
G3	US ASCII
Autowrap	Disabled
Line Feed/New Line Mode	Reset
Horizontal Tabs	Every 8 columns (9,17 ...)
Unsolicited Reports	Disabled
Super/Subscripts	Disabled
Carriage Return/New line	Reset
Vertical Tabs	Every line (1-66)

DECSBCA

Select Bar Code Attributes: This sequence will select a bar code type and orientation.

General Command Syntax
ESC [P1;P2;P2; ... ;P9 s

P1: Bar Code Style
The allowed values for P1 are shown in the following table.

P1	Bar Code Style
0/missing	Code 3 of 9 (default)
1	Interleave 2 of 5
2	Code 3 of 9
3	Extended Code 3 of 9 (not implemented)
4	EAN-8
5	EAN-13
6	Code 11
7	Codabar (a/t)
8	Codabar (b/n)
9	Codabar (c/*)
10	Codabar (d/e)
11	UPC-A
12	UPC-E
13	Postnet
14	Code 128
15	Code 128-UCC

P2: Width for Narrow Bars and Spaces
Sets width for the narrow bars and spaces in units specified by SSU.
Default = 10 pixels = 12 decipoints

P3: Width for Quiet Zone
Not implemented.

P4: Width for Wide Bars and Spaces
Sets width for the wide bars and spaces in units specified by SSU.
Default = 30 pixels = 36 decipoints

P5: Intercharacter Gap
Sets the intercharacter gap in units specified by SSU.
Default = 10 pixels = 12 decipoints

P6: Bar code Height
Bar code height in $1/12^{th}$-inch increments

1	minimum bar code height = 1/12 inch)
120	maximum bar code height = 10 inches
9	default bar code height = 0.75 inch

P7: Encoding Character
Not implemented.

P8: Bar code Rotation

0	no rotation (default)
1	no rotation
2	270 degrees rotation
3	90 degrees rotation
4	180 degrees rotation

P9: Human Readable Input (HRI) Font

0	No human readable characters printed;
1	No human readable characters printed;
2	Special bar code HRI font;

Decimal: 27 71 P1 ; P2 ; ... ; P9 ' q
Hex: 1B 5B P1 3B P2 3B ... P9 27 71
BASIC: CHR$(27);"[";P1;";";P2;";"; ... ;P9;"'q";

DECSTBM

Set Top and Bottom Margins: Sets the top and bottom margins, and the page home line. Pn1 sets the top margin and the page home line. Pn2 sets the bottom margin. The top margin defines the first printable line on a page. The bottom margin defines the last printable line. The page home line is the position of the first printable line on the page after a form feed.

General Command Syntax

ESC [Pn1 ; Pn2 r

Decimal: 27 71 Pn1 ; Pn2 86
Hex : 1B 5B Pn1 3B Pn2 72
BASIC: CHR$(27);"[";Pn1;";";Pn2;"r";

Indeterminate Conditions

If Pn1 is 0 or omitted, the top margin is unchanged.

If Pn2 is 0 or omitted, the bottom margin is unchanged.

If Pn2 is greater than the form length, the bottom margin is set at the bottom of form.

If the active position is less than the new top margin, the active position is set to the new top margin. If the active line is greater than the new bottom margin, the next printable character causes a form feed.

If the sequence sets the top margin below the bottom margin, the command is ignored.

If the form length is changed, the printer sets the top margin to line 1 and the bottom margin to the form length.

DECSLRM

Set Left and Right Margins: Sets the left and right margins. Pn1 sets the left margin and the line home position. Pn2 sets the right margin. If the first parameter is greater than the second parameter, the sequence will be ignored. The unit of measurement can be character cells, decipoints, or pixels. The maximum allowable value of the Pn1 parameter is always one less than the Pn2 parameter.

The left margin defines the first printable position on a line. The right margin defines the last printable position on a line.

General Command Syntax
ESC [***Pn1 ; Pn2*** s

Indeterminate Conditions
If Pn1 is 0 or omitted, the left margin is unchanged.

If Pn2 is 0 or omitted, the right margin is unchanged.

If Pn2 is greater then the printable width, the right margin is set to the right limit.

If the sequence sets the left margin to the right of the right margin, the command is ignored.

If the active position is less than the new left margin, the active position is set to the left margin.

Decimal: 27 71 ***Pn1*** 59 ***Pn2*** 115
Hex : 1B 5B ***Pn1*** 3B ***Pn2*** 73
BASIC: CHR$(27);"[";***Pn1***;";";***Pn2***;"s";

DECSLPP

Set Lines per Physical Page: Defines form length. DECSLPP sets the top margin to 1 and the bottom margin to the form length. Pn sets the form length in the units defined by the PUM and SSU sequences.

General Command Syntax
ESC [***Pn*** t

Indeterminate Conditions
If Pn1 is 0 or omitted, the form length is set to 11 inches.

Decimal: 27 71 ***Pn*** 88
Hex : 1B 5B *Pn* 74
BASIC: CHR$(27);"[";***Pn***;"t";

DECSHTS

Set Horizontal Tab Stops: This sequence will set multiple horizontal tab stops. **DECSHTS** allows up to 16 tab stops to be set at once. Up to 32 horizontal tabs can be stored. If more than 32 tabs are specified by the escape sequence, the leftmost 32 will be retained. The Pn values can be in any order in the escape sequence. The value units are in decipoints, pixels, or character cells depending on the selection of PUM and SSU.

General Command Syntax
ESC [**P1 ; P2 ; ... ; P32** u

Decimal: 27 71 ***Pn1*** ; ***Pn2*** ; ... ; ***Pn16*** u
Hex: 1B 5B ***Pn1*** 3B ... ***Pn16*** 75
BASIC: CHR$(27);"[";***Pn1***;";";***Pn2***;";"; ... ;***Pn16***;"u";

NOTE
The tabs are set and sorted into the current settings. If the current settings are 1", 2", and 3", a command to set a tab at 1.5" would now have four tab sets.

DECSVTS

Set Vertical Tab Stops: This sequence will set multiple vertical tab stops. DECSVTS allows up to 16 tab stops to be set at once. Up to 67 vertical tabs can be stored. The default is set to stop at every line. The Pn values can be in any order in the escape sequence. The value units are in decipoints, pixels, or lines depending on the selection of PUM and SSU.

General Command Syntax
ESC [***Pn1*** ; ***Pn2*** ; ... ; **Pn16** v

Decimal: 27 71 ***Pn1*** ; ***Pn2*** ; ... ; ***Pn16*** v
Hex : 1B 5B ***Pn1*** 3B ... ***Pn16*** 76
BASIC: CHR$(27);"[";***Pn1***;";";*Pn2*;";"; ... ;***Pn16***;"v";

NOTE
The tabs are set and sorted into the current settings. If the current settings are 1", 2", and 3", a command to set a tab at 1.5" would now have four tab sets.

DECSHORP

Set Horizontal Pitch: This sequence will set the number of characters printed per horizontal inch on a line. In addition to changing character size, this sequence will reset the left and right margins and will retain the current horizontal tab settings. Ps selects the horizontal pitch as defined in the following chart.

General Command Syntax
ESC [***Ps*** w

Select Horizontal Pitch

Ps	Horizontal Pitch
0	10 characters per inch
1	10 characters per inch
2	12 characters per inch
3	13.3 characters per inch
4	16.7 characters per inch
5	5 characters per inch
6	6 characters per inch
7	6.6 characters per inch
8	8.25 characters per inch
9	15 characters per inch

Decimal: 27 71 ***Ps*** 91
Hex : 1B 5B ***Ps*** 77
BASIC: CHR$(27);"[";***Ps***;"w";

DECVERP

Set Vertical Pitch: This sequence will set the number of lines per inch on the page. Ps selects the vertical pitch as defined in the following chart.

General Command Syntax
ESC [***Ps*** z

Select Vertical Pitch

Ps	Vertical Pitch
0	6 lines per inch
1	6 lines per inch
2	8 lines per inch
3	12 lines per inch
4	2 lines per inch
5	3 lines per inch
6	4 lines per inch
10	6 lines per inch
11	6 lines per inch

Indeterminate Conditions
No parameter will result in a default of 6 LPI. Values not listed are ignored.

Decimal: 27 71 ***Ps*** 94
Hex: 1B 5B ***Ps*** 7A
BASIC: CHR$(27);"[";***Ps***;"z";

DECSGD

Set Graphics Density: DECSGD sets the density for graphics. Psh designates the horizontal dot density and Psv designates the vertical dot density.

General Command Syntax
ESC [***Psh*** ; ***Psv*** & {

Psh	Horizontal Density
0	No change
1	50 Dots per Inch
2	60 Dots per Inch
3	70 Dots per Inch
4	80 Dots per Inch
5	90 Dots per Inch
6	100 Dots per Inch
7	110 Dots per Inch
8	120 Dots per Inch
9	130 Dots per Inch
10	140 Dots per Inch
11	150 Dots per Inch
12	200 Dots per Inch

Psv	Vertical Density
0	No change
1	30 Dots per Inch
2	40 Dots per Inch
3	50 Dots per Inch
4	60 Dots per Inch
5	66 Dots per Inch
6	75 Dots per Inch
7	86 Dots per Inch
8	100 Dots per Inch
9	120 Dots per Inch
10	150 Dots per Inch
11	200 Dots per Inch

Decimal: 27 71 ***Psh*** 59 ***Psv*** 38 95
Hex : 1B 5B ***Psh*** 3B ***Psv*** 26 7B
BASIC: CHR$(27);"[";Psh;";";Psv;"&{";

DECVEC

Drawing Vectors: This sequence draws horizontal or vertical lines with length and width. Margins do not affect line drawing so you can draw lines to the physical limits of the page. Use the following Pn parameters to select the length, width, and direction of the line. An incorrect Pn value will cancel the entire sequence.

General Command Syntax
ESC [Pn1 ; Pn2 ; ... ; Pn5 ; ! |

P1: Define Line

0 = Draw a horizontal line to the right.
1 = Draw a vertical line down.

P2: Select the X Start Position
This parameter selects the horizontal start position on the page in decipoints.

P3: Select the Y Start Position
This parameter selects the vertical start position on the page in decipoints.

P4: Select the Line Length
Select the line length in the X direction for an X line. For a Y line, it specifies the Y direction length. A 0 value defaults to 1 decipoint.

P5: Select the Line Width
Select the line width for both X and Y lines. A 0 value defaults to 1 decipoint.

Decimal: 27 71 ***Pn1*** 59 ***Pn2*** 59 ... 59 ***Pn5*** 59 33 96
Hex : 1B 5B ***Pn1*** 3B ***Pn2*** 3B ... 3B ***Pn5*** 3B 21 7C
BASIC: CHR$(27);"[";***Pn1***;";";***Pn2***;";"; ... ;***Pn5***;";";"!|";

CHAPTER 8. PPL3 PLUS EMULATION

INTRODUCTION

General Considerations

This chapter describes the GENICOM 5000 implementation of the DEC PPL3 printer protocol. The focus is on the following:

- Control Codes
- Special Characters
- Commands
- Page Coordinate System
- Sixel Graphics

While PPL3 emulation is backward compatible with PPL1 and PPL2 commands, it is not recommended that the user mix commands from different levels of the PPL emulation.

Coded Characters

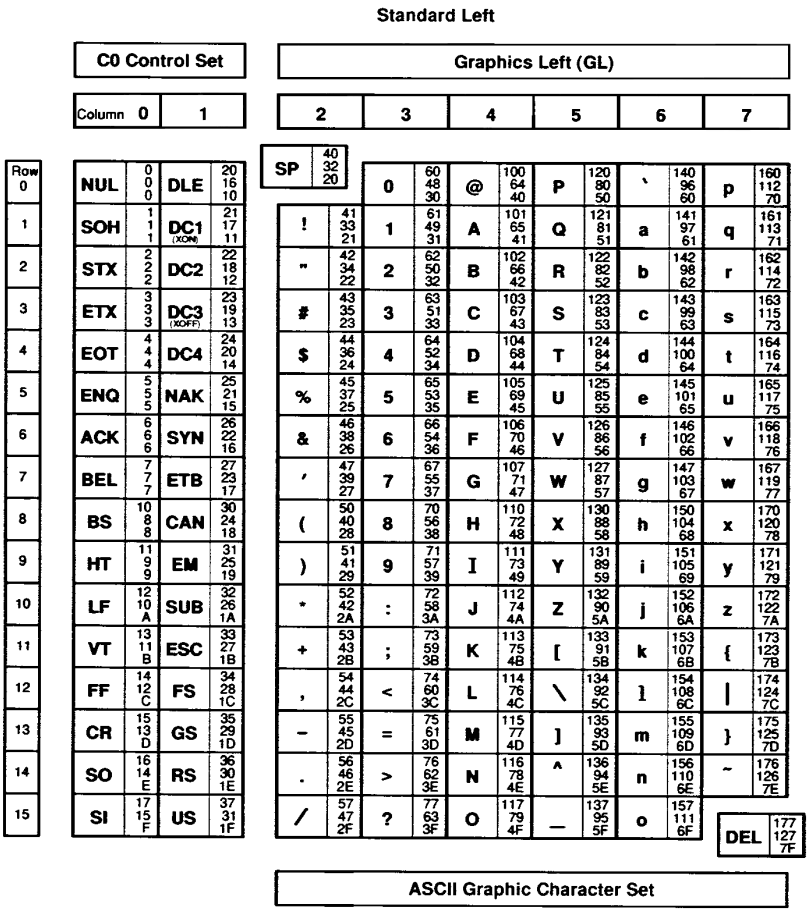
Character processing within the PPL3 emulation is broken down into several categories of characters.

- **C0 Control Set:** 00H-1FH (0-31 decimal).
- **GL Graphics Characters:** 94 graphic characters in the range of 21H-7EH (33-126 decimal) referred to as the left-hand graphics set.
- **C1 Control Set:** 80H-9FH (128-159 decimal).
- **GR Graphics Characters:** 94 graphic characters in the range of 10H-FEH referred to as the right-hand graphics set.
- **Special Characters:** This are outside of the other ranges described and consist of the characters represented by the hexadecimal values 20, 7F, A0, and FF.

7-Bit Versus 8-Bit Environments

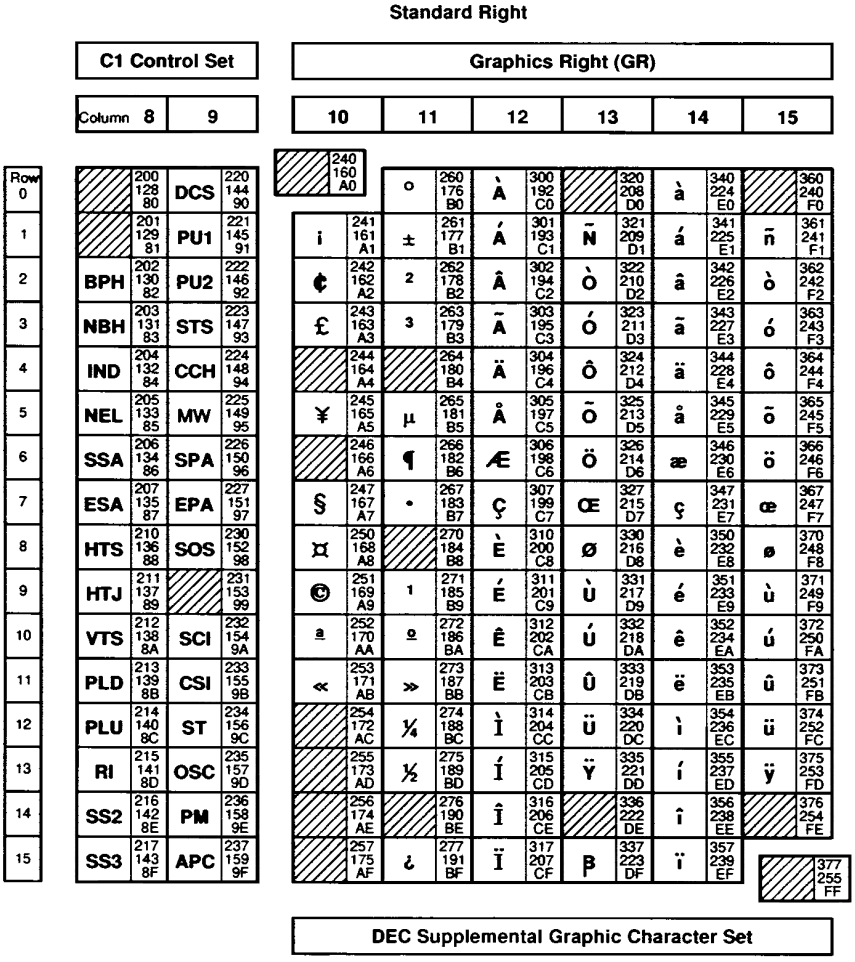
In some environments, only 7 bits are used to encode characters. In these environments, the standard 7-bit character set applies. This set includes only the C0 and GL character sets and the special characters represented by hexadecimal values 20 and 7F.

7-Bit Character Set (8-Bit Left Half)



In an 8-bit environment, the low order 7 bits determine whether a character is printable or is a control character. The standard 8-bit code table consists of the entries above as well as the 8-bit right-half table that follows.

Standard 8-Bit Code Table (Right Half)



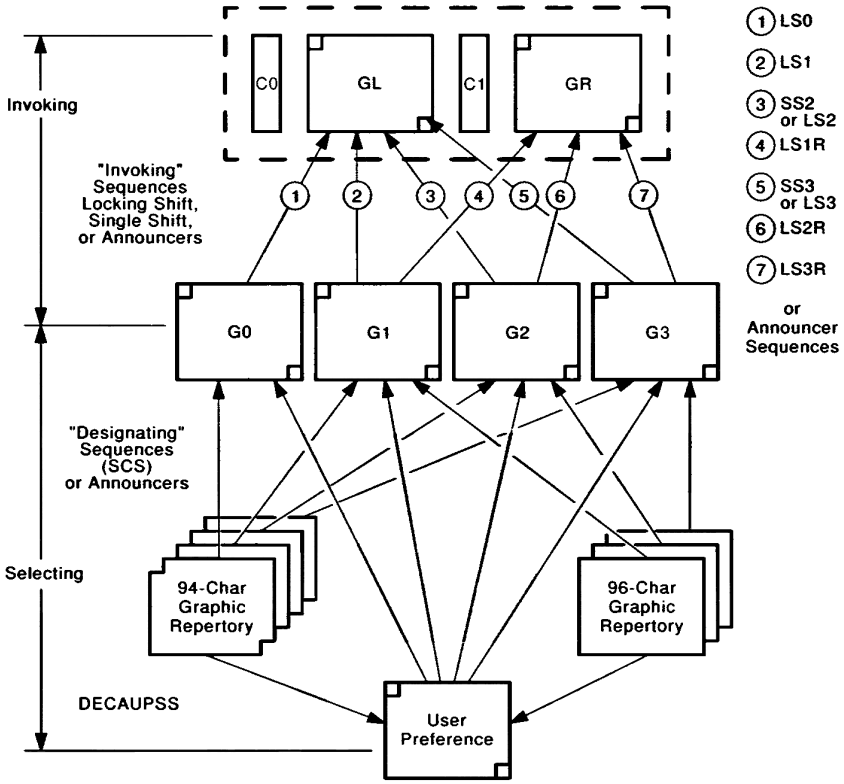
Printable Characters

The GL characters in a 7-bit environment and GL and GR in an 8-bit environment are interpreted as printable if they are not embedded in a control function. It takes selection of both a font and a graphic character set to specify a character to be printed. The font is made up of a type style, a size, and a design (regular, bold, italics).

Choosing a graphics character set involves the following steps:

- Designate the graphics character set as one of the logical sets G0, G1, G2, or G3.
- Assign (map) one of the sets above into the graphic left (GL) or graphics right (GR) logical set.

Designating and Invoking Character Sets



CONTROL CODES

Introduction

Generally, control codes are not printed and cause the printer to perform a control function. Within PPL III, there is an exception when Control Representation Mode (CRM) is set.

C0 Control Characters

C0 control characters are in the range of 00H to 1FH. With the exception of Escape (ESC), Cancel (CAN), and Substitute (SUB), C0 control characters do not affect escape sequences, control sequences, or control strings.

Only the control characters listed below are implemented. All others are ignored.

BEL **Bell (07H):** BEL causes the printer to sound a bell or buzzer.

BS **Backspace (08H):** BS moves the active horizontal position back one Horizontal Advance Increment (HAI). See the section later in this chapter on the Page Coordinate System. BS is active within the page boundaries, i.e., there is no effect if the current Active Position is outside of the left or right margin settings.

CAN **Cancel (18H):** CAN is ignored unless received in an escape sequence, control sequence, or control string. In these instances, CAN causes the sequence or string being processed to abort.

CR **Carriage Return (0DH):** CR sets the active horizontal position to the Line Home Position, even when the active horizontal position is to the left of the Line Home Position. If Carriage Return/New Line Mode (DECCRNLM) is set, the printer also moves down one Vertical Advance Increment (VAI). If PLD or subscript counts are non-negative, then a CR executed beyond the bottom margin causes a form feed.

See the section later in this chapter on the Page Coordinate System.

ESC **Escape (1BH):** ESC introduces an escape sequence. An ESC control character received in an escape sequence, control sequence, or control string aborts that sequence and begins a new escape sequence.

FF **Form Feed (0CH):** FF indicates the end of the current page and the beginning of a new page. Subsequent output will appear on the new page. FF sets the active vertical position to the Page Home Line. FF does not modify the active horizontal position. See the section on the Page Coordinate System for further information on the interaction with coordinate system bounds.

HT **Horizontal Tab (09H):** HT moves the active position to the next horizontal tab stop on the same line. If no tab stop exists to the right of the active horizontal and within the right margin, HT moves to the right margin and sets the Right Margin Flag.

If no tabs are set and bar code is not active, HT moves the active horizontal position to the right margin.

LF **Line Feed (0AH):** LF moves the active vertical position down one Vertical Advance Increment (VAI). If Line Feed/New Line Mode (LNM) is set, the active horizontal position moves to the Line Home Position. See the section on the Page Coordinate System later in this chapter.

SI **Shift In (0FH):** SI, also named Locking Shift Zero (LS0), maps character set G0 as the GL character set.

SO **Shift Out (0EH):** SO, also named Locking Shift One (LS1), maps character set G1 as the GL character set.

SUB **Substitute (1AH):** This sequence aborts the sequence in progress. SUB in a control string generally aborts the string in progress. (Need a reference to a local equivalent of table 2-2 in the spec.)

SUB in printable text causes the error character to be printed. The error character is taken from the GL font. *The error character for most fonts is a distinctive reverse question mark. In some instances a normal ? character is printed.*

VT **Vertical Tab (0BH):** VT moves the active position to the next vertical tab stop on the current page. If no tab exists between the active position and the bottom margin, VT moves the active position to the bottom margin. Be aware that this command interacts with coordinate system bounds. If no vertical tabs have been set, then VT moves the active position to the bottom margin.

C1 Control Characters

All C1 control characters abort any escape sequence, control sequence, or control string in progress. See the section on Special Parsing Requirements earlier in the chapter.

C1 control characters can be represented by a 7-bit equivalent escape sequence. See the following table.

8-Bit Column/Row	Mnemonic	7-Bit Equivalent Sequence	
8/0	Reserved	ESC @	1B 40
8/1	Reserved	ESC A	1B 41
8/2	Reserved	ESC B	1B 42
8/3	Reserved	ESC C	1B 43
8/4	IND	ESC D	1B 44
8/5	NEL	ESC E	1B 45
8/6	SSA	ESC F	1B 47
8/7	ESA	ESC G	1B 47
8/8	HTS	ESC H	1B 48
8/9	HTJ	ESC I	1B 49
8/10	VTS	ESC J	1B 4A
8/11	PLD	ESC K	1B 4B
8/12	PLU	ESC L	1B 4C
8/13	RI	ESC M	1B 4D
8/14	SS2	ESC N	1B 4E
8/15	SS3	ESC O	1B 4F
9/0	DCS	ESC P	1B 50
9/1	PU1	ESC Q	1B 51
9/2	PU2	ESC R	1B 52
9/3	STS	ESC S	1B 53
9/4	CCH	ESC T	1B 54
9/5	MW	ESC U	1B 55
9/6	SPA	ESC V	1B 56
9/7	EPA	ESC W	1B 57
9/8	Reserved	ESC X	1B 58
9/9	Reserved	ESC Y	1B 59
9/10	Reserved	ESC Z	1B 5A
9/11	CSI	ESC [	1B 5B
9/12	ST	ESC \	1B 5C
9/13	OSC	ESC]	1B 5D
9/14	PM	ESC ^	1B 5E
9/15	APC	ESC _	1B 5F

CSI **Control Sequence Introducer (CSI):** CSI introduces a control sequence. A CSI control character received in an escape sequence, control sequence, or control string aborts that sequence and begins a new control sequence. For those familiar with escape sequence programming, CSI is the ESC [sequence.

DCS **Printer Control String (90H):** DCS introduces a printer control string. A DCS control character received in an escape sequence, control sequence, or control string aborts that sequence and begins a new printer control string.

EPA **End of Protected Area (97H):** EPA aborts any escape sequence, control sequence, or control string in progress. It is ignored otherwise.

ESA **End of Selected Area (87H):** ESA aborts any escape sequence, control sequence, or control string in progress. It is ignored otherwise.

HTS **Horizontal Tab Set (88H):** HTS sets a horizontal tab stop at the active horizontal position. No change occurs if the active horizontal position is in the tab table. If the table is full, the highest tab stop is lost. When the new tab would be the highest and the table is already full, the new tab is lost.

IND **Index (84H):** IND moves the active vertical position down one Vertical Advance Increment. It behaves the same as Line Feed. See the section later in the chapter on the Page Coordinate System.

NEL **Next Line (85H):** NEL sets the active horizontal position to the Line Home Position and moves the active vertical position down one Vertical Advance Increment. See Page Coordinate System later in the chapter.

PLD **Partial Line Down (8BH):** PLD moved the active vertical position downward by the Subscript Vertical Distance. This is discussed further in the section on Page Coordinate System later in the chapter.

PLU **Partial Line Up (8CH):** PLU moves the active vertical position upward by the Superscript Vertical Distance. This is discussed further in the section on Page Coordinate System later in the chapter.

RI **Reverse Index (8DH):** RI moves the active vertical position up one Vertical Advance Increment (VAI). The maximum allowable movement is to the top margin. This is discussed further in the section on Page Coordinate System later in the chapter.

SS2 **Single Shift 2 (8EH):** SS2 temporarily maps character set G2 into GL to print one character.

SS3 **Single Shift 3 (8FH):** SS3 temporarily maps character set G3 into GL to print one character.

ST **String Terminator (9CH):** ST indicates the end of a control string.

VTS **Vertical Tab Set (8AH):** VTS sets a vertical tab stop. If the First Character Flag is set, the tab stop is set at the active vertical position. If the First Character Flag is not set, VTS sets the active vertical position minus the Above Baseline Offset. No change occurs if that position is already a vertical tab stop.

If the vertical tab table is full and the new tab position is less than the highest entry in the table, the new tab stop is inserted and the highest entry is lost. If the new tab stop would be the highest, then the new tab stop is lost.

RESERVED The hex values 80H to 83H and 98H through 9AH are reserved for future use. If encountered they abort any escape sequence, control sequence, or control string in progress. They are ignored otherwise.

SPECIAL CHARACTER PROCESSING

As mentioned in the introduction, four characters are considered special characters. The processing for these characters is described below.

Hex 20

If a 94-character graphic character set has been mapped into the GL region, 20H always prints as a space character (SP). The justification feature can modify how space characters are treated (See the JFY command).

If a 96-character graphic character set has been mapped into the GL region, then 20H causes the specified character from that set to be printed. If 20H is undefined in that character set, the error character is printed.

Hex 7F

If a 94-character graphic character set has been mapped into the GL region, 7FH is always ignored.

If a 96-character graphic character set has been mapped into the GL region, 7FH causes the specified character from that set to be printed. If 7FH is undefined in that character set, the error character is printed.

Hex A0

If a 94-character graphic character set is selected into GR, A0H causes the error character to print.

If a 96-character graphic character set resides in GR, A0H prints the specified character from that set. If A0H is undefined in that set, the error character is printed.

Hex FF

If a 94-character graphic character set has been mapped into the GR region, FFH is always ignored.

If a 96-character graphic character set has been mapped to GR, FFH prints the specified character from that set. If FFH is undefined in that set, the error character is printed.

Special Character Parsing

Received Character	ESC, CSI, DCS Intro	Sixel	DECATFF	DECDTFF	DECAUPSS	DECLFF	Undefined Control String
ESC	See 1	See 1	See 1	See 1	See 1	See 1	See 1
CAN	See 2	See 2	See 2	See 2	See 2	See 2	See 2
SUB	See 3	Treat as 3FH	See 3	See 3	See 3	Treat as 3FH	See 3
BEL, SI, SO	See 4	See 4	Ignore	Ignore	Ignore	Ignore	See 4
Other C0	See 4	Ignore	Ignore	Ignore	Ignore	Ignore	See 4
21H – 7EH	See 5	See 5	See 5	See 5	See 5	See 5	Ignore
80H – 9FH	See 6	See 6	See 6	See 6	See 6	See 6	See 6
A1H – FEH	See 7	See 7	See 7	See 7	See 7	See 7	See 7
20H	See 8	Ignore	Ignore	Ignore	See 8	Ignore	Ignore
A0H	See 8	Ignore	Ignore	Ignore	See 8	Ignore	Ignore
7FH	Ignore	Ignore	Ignore	Ignore	Ignore	Ignore	Ignore
FFH	Ignore	Ignore	Ignore	Ignore	Ignore	Ignore	Ignore

Action taken:

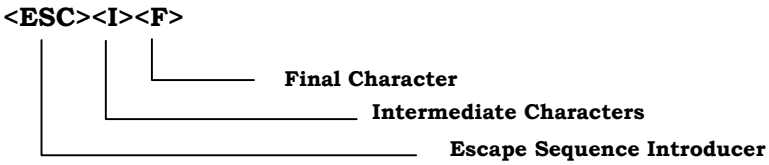
1 Character aborts the command, then introduces a new command
2 Character aborts the command, then CAN is processed
3 Character aborts the command, then SUB is processed
4 Character is processed as if received before the command, then command processing resumes
5 Character is processed as a printable character
6 Character aborts the command, then the control character is processed
7 Eighth bit of character is ignored, then processed as a GL printable character
8 Character processed as 20H (space)

ESCAPE SEQUENCE / CONTROL FUNCTION SYNTAX

Within PPL III, the overall description given to control codes, escape sequences and control strings is "commands." For consistence with the rest of this manual, separateness will be maintained.

Escape Sequence Syntax

Escape sequences have the following general format:



Example: ESC (B

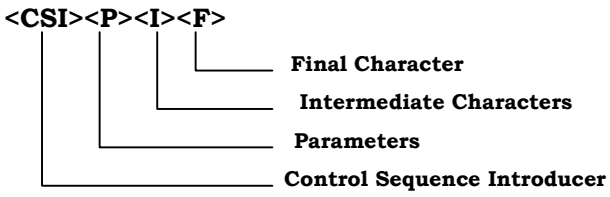
CSI: The ESC control character (1BH) is the **escape sequence introducer**.

I: Intermediate characters received after and ESC and should be in the range of 20H to 2FH. No more than 3 intermediate characters are permitted within PPL III. If four or more intermediate characters are received before the final character, the event is noted and the entire sequence is ignored.

F: A **final character** is in the range of 30H to 7EH. It indicates the end of an escape sequence. The intermediate characters (if any) and the final character, taken together, define the function of the sequence.

Control Sequence Syntax

Control sequences differ from escape sequences in that they have parameters that modify the function of the control sequence. The general format for a control



CSI: The control sequence introducer has a hex value of 9B. This is equivalent to a 7-bit escape sequence of ESC [or 1BH 5BH. Both encodings are recognized as a CSI.

Parameters: Parameter characters are in the range of 30H to 3FH. A parameter modifies the action of the control sequence. Generally, parameters are ASCII digits and act as a numerical index in the sequence. Within PPL III, the occurrence of the "?" character (3FH) or

the ">" character (3E) at the beginning of a parameter string indicates the presence of Digital private parameters.

If the ":" (3AH), "<" (3C), or the "=" (3D) characters are received during the processing of a parameter string, or if the ">" or "?" characters are received after the first character of a parameter string, the string will be ignored.

I: Intermediate characters received after and ESC and should be in the range of 20H to 2FH. No more than 1 intermediate character is permitted. If more than one intermediate character is received before the final character, the event is noted and the entire sequence is ignored.

F: A **final character** is in the range of 40H to 7EH. It indicates the end of an escape sequence. The intermediate characters (if any) and the final character, taken together, define the function of the sequence.

Parameter Values Within Control Sequences

Parameter values are either numeric values or selection indices. Numeric values typically specify a distance or a quantity pertaining to a control function. Selective parameters are interpreted as specifying a choice from an available list for a parameter. Parameter values must be unsigned digits. Leading zeroes are permitted, but ignored.

If no value is received for a parameter, a value of zero is assumed. The maximum value for a parameter is the greatest value needed by any supported control sequence. In a PPL III compliant printer, the maximum value is the maximum paper size expressed in centipoints (1/7200-inch). For example, if a printer supports 21-inch paper, the maximum parameter size would be 21x7200=151,200 centipoints.

If multiple parameters appear in a control sequence, they must be separated by semi-colons (";"). A maximum of 16 parameters is allowed. If more are received, only the first 16 are evaluated. Additional parameters are ignored, but do not cause the sequence to be invalid.

COMMAND DIRECTORY

COMMAND DICTIONARY

ASCEF

Announce Subset of Code Extension Facilities: This indicates which subset of code extension facilities or what level of ISO 4873 is used for subsequent exchanges of information. These three control functions are macros that incorporate the effects of Select Character Set (SCS) and Locking Shift (LS) commands.

Source: Printer **Destination:** Application

Description

Level 1 and level 2 result in the following settings:

- ASCII is assigned to G0 and mapped into GL.
- ISO Latin-1 Supplemental is assigned to G1 and mapped into GR.

Level 3 results in the following settings:

- ASCII is assigned to G0 and mapped into GL.

Format

Mnemonic:	ESC SP L	ISO 4873, level 1
Decimal:	27 32 76	
Hex:	1B 20 4C	
BASIC:	CHR$(27);" L";	
Mnemonic:	ESC SP M	ISO 4873, level 2
Decimal:	27 32 77	
Hex:	1B 20 4D	
BASIC:	CHR$(27);" M";	
Mnemonic:	ESC SP N	ISO 4873, level 3
Decimal:	27 32 78	
Hex:	1B 20 4E	
BASIC:	CHR$(27);" N";	

CPR

Cursor Position Report: Response by a printer to an application for a Printer Status Request (DSR) cursor position request. It returns the current horizontal and vertical position via the serial connection.

Source: Printer **Destination:** Application

Format

Mnemonic:	CSI Pn1 ; Pn2 R
Decimal:	155 Pn1 59 Pn2 82
Hex:	9B Pn1 3B Pn2 52
BASIC:	CHR$(155);Pn1;";";Pn2;"R";

Description

The CPR parameters are defined as follows:

Pn1: Numeric parameters describing the active vertical position.
Pn2: Numeric parameter describing the active horizontal position.

CRM

Control Representation Mode: This sequence enters or exits a mode in which the printer prints a graphic token for each byte. In this mode, the printer does not act upon control characters.

Source: Application **Destination:** Exception (debug tool)

Format

ESC 3 h	Set CRM
ESC 3 l	Reset CRM

Description

When Control Representation Mode is set, the printer does not act on control or special characters, with the following exceptions:

- Line Feed (LF) is printed as **<LF>**, then a Carriage Return/Line Feed is executed.
- Form Feed (FF) is printed as **<FF>,** then a Form Feed is executed.
- The Control Representation Mode reset command is printed as **<CSI> 3 1**, then is executed.

CUU

Cursor Up: Executes Vertical Position Backwards (VPB). CUU exists for backwards compatibility with older printers only. Use VPB instead of CUU. Future printers may not implement CUU.

Source: Application Destination: Level 3 (outmoded command)

Description

See VPB.

DA

Printer Attributes: Requests the printer product identification. The printer responds to the DA command by sending a Printer Attributes Report (DAR). See DAR.

Use DA (generic response) for normal Print manager inquiries and forward compatibility. Use DA (alias response) for backwards compatibility with older printers.

It is recommended that you send this command with no parameter. Although the DEC PPL3 parsing rules allow a parameter in any control sequence, this command is traditionally sent without one.

Source: Print manager **Destination:** Levels 1, 2, 3

Format

CSI PS c Ps (if present) must equal 0.

DAR

Printer Attributes Report (generic response): Response to a Print manager request for a Printer Attributes (DA) report.

Source: Printer **Destination:** Print manager

Format

CSI ? Ps1 Ps2 … Psn c

Description

The printer sends this command when set to the generic response. The printer may be set to use the alias response. See DAR (alias response) in this chapter.

Ps1 = 73

Ps2-Psn describe the implemented extensions to the protocol. See the introduction to this chapter for an explanation of extensions. The following table contains a list of possible extensions.

Parameter		Protocol Extension
Hex	Decimal	
34	4	Sixel graphics
35	5	Katakana character set
36	6	Reserved
38	8	Reserved
39	9	Variable page format select
31 30	10	Text ruling vector drawing
31 31	11	Reserved
31 32	12	Hebrew character sets

The reply to the DA request is sent to the host only after all preceding data (except DSR) has been processed and printed. This provides a way for host software to determine when all preceding data has been successfully printed.

When values are not returned, they are left out of the response entirely (that is, there are not any blanks indicated by semicolons). However, software should always accept blank parameters.

The printer sends parameters in ascending order. However, software should accept the parameters in any order.

DAR

Printer Attributes Report (alias response): Response to a Print manager request for a Printer Attributes (DA) Report.

Source: Printer **Destination:** Print manager

Format

CSI ? Ps1 Ps2 Psn c

Description

The printer sends this sequence when set to the alias response. The printer may be set to use the generic response. See the Programming Supplement for configuration information, and for the alias responses supported by the printer.

The reply to the DA request is sent to the host only after all preceding data (except DSR) has been processed and printed. This provides a way for host software to determine when all preceding data has been successfully printed.

DA2

Secondary Printer Attributes: Requests a Secondary Printer Attributes Report.

Source: Print manager **Destination:** Levels 1, 2, 3

Format

CSI PS > C Ps (if present) must equal 0.

Description

The printer responds to the DA2 request by sending a Secondary Printer Attributes Report (DAM).

Notes to Software

This command should be used only by diagnostic programs or specialized print managers.

Use DA (generic response) for normal Print manager inquiries and forward compatibility. No additional data is sent by the printer to the print manager.

DECAUPSS **Assign User Preference Supplemental Set:** Assigns a particular character set to the User Preference Supplemental set. This becomes the character set designated by the User Preference character set final when used in a Select Character Set (SCS) sequence.

Source: Print manager **Destination:** Levels 1, 2, 3

Format

DCS Ps U D ... D ST

Description

Ps indicates whether the User Preference set is a 94-character or a 96-character set:

Ps	Meaning
0	94-character set
1	96-character set

D ... D is a string containing the intermediate and final characters of the designating sequence used to explicitly select the supplemental character set. See SCS in this chapter for a list of intermediate and final characters.

To assign DEC Supplemental as the User Preference character set, use the following DECAUPSS command:

DCS 0 ! u %5 ST

To assign ISO Latin-1 Supplemental as the User Preference set, use the following DECAUPSS command:

DCS 1 ! u A ST

To use the User Preference set, see User Preference under SCS.

The supported character sets are as follows:

- DEC Supplemental (Ps must equal 0)
- ISO Latin-1 Supplemental (Ps must equal 1)
- DEC Hebrew Supplemental (Ps must equal 0)
- ISO Latin-Hebrew Supplemental (Ps must equal 1)
- DEC Technical (Ps must equal 0)
- Hebrew 7-bit (Ps must equal 0)

Error Handling

The printer accepts the User Preference Supplemental character set selection even if the selected character set is not currently available. The character set may be downloaded before imaging text. If the character set is still not available when an imaging function is attempted, the printer follows the action taken on a character set fault.

If Ps does not have the appropriate value for the D ... D identifier, a character set fault results.

DECAWM

Autowrap Mode: Instructs the printer whether to execute an automatic Carriage Return/Line Feed when the active position exceeds the right margin.

Source: Application **Destination:** Level 2

Format

CSI ? 7 h	Set Autowrap mode.
CSI ? 7 1	Reset Autowrap mode.

Description

When DECAWM is set and the active position is beyond the right margin, printable characters that follow are printed on the next line beginning at the Line Home Position. When DECAWM is reset, all printable characters received beyond the right margin are ignored (truncated).

The printer never autowraps text during justification. See JFY for more information.

The printer always autowraps during Control Representation Mode (CRM).

DECCAHT

Clear All Horizontal Tabs: Clears horizontal tab stops.

Source: Application Destination: Level 2

(outmoded command)

Format

ESC 2 1/11 3/2

Description

See Tabulation Clear (TBC) with Ps = 2.

Notes to Software

This command is included for backwards compatibility with older printers only. Conforming software should not use this command.

DECCAVT **Clear All Vertical Tabs:** Clears vertical tab stops.

Source: Application **Destination:** Level 2 (outmoded command)

Format

ESC 4

Description

See Tabulation Clear (TBC) with Ps = 4.

Notes to Software

This command is included for backwards compatibility with older printers only. Conforming software should not use this command.

DECCRNLM **Carriage Return /New Line Mode:** Instructs the printer whether to perform a Line Feed (LF) upon receipt of a Carriage Return (CR).

Source: Print manager Destination: Levels 2, 3

Format

CSI ? 4 0 h	CR acts as New Line.
CSI ? 4 0 1	CR acts as Carriage Return.

Description

If DECCRNLM is set and a CR is received, the active position advances to the Line Home Position of the next line. If DECCRNLM is reset and a CR is received, the active position returns to the Line Home Position of the current line.

Notes to Software

Print managers developed by Digital handle record terminators without using Carriage Return/New Line Mode. This command is available for third-party Print managers.

DECHTS **Horizontal Tab Set:** Executes Horizontal Tab Set (HTS).

Source: Application **Destination:** Level 2(outmoded command)

Format

ESC 1

Description

See HTS in the Control Characters section, p. 202.

Notes to Software

This command is included for backwards compatibility with older printers only. Conforming software should not use this command.

DECIPEM

Entering IBM Proprinter Emulation Mode: Executes Set Other Coding System (SOCS), enabling IBM Proprinter Emulation mode.

Source: Print manager Exception

Destination: Levels 2, 3

Format

CSI ? 5 8 h

Description

See SOCS with final character "=" (3DH).

Some printers do not support Emulation mode

Notes to Software

This command is provided for backwards compatibility with older printers only. Conforming software should use SOCS instead.

DECNS

New Sheet: Executes a conditional Form Feed.

Source: Application

Destination: Level 3 extension

Format

CSI Pn SP s

Pn must equal 0.

DECPSM

Pitch Select Mode: When set, postpones processing of Set Horizontal Pitch (DECSHORP). The pitch is based on the font. When reset, uses the horizontal pitch selected by DECSHORP.

Source: Application

Destination: Levels 2, 3 (outmoded command)

Format

CSI ? 2 9 h	Sets Horizontal Pitch Select Mode.
CSI ? 2 9 1	Resets Horizontal Pitch Select Mode.

Description

When the selected font cannot be modified algorithmically to match the pitch selected by DECSHORP, DECPSM defines whether to use the pitch from the font, or to print the characters at an unnatural pitch.

By extension, even if the font can be modified, DECPSM is used to force the use of the natural pitch of the selected font and postpone the processing of DECSHORP.

When DECPSM is set, received DECSHORP values are stored but not processed. When DECPSM becomes reset, the pending DECSHORP (if any) is processed.

If there is no concept of natural pitch implemented within the printer, DECPSM is ignored.

Side Effects

DECPSM can cause a change in pitch such that a pending DECSHORP may be executed. This results in the side effects described under the DECSHORP command.

If the DECPSP (Proportional Spacing) command is set, the DECPSM command sets the tabs and margins as usual, as listed in Side Effects under DECSHORP in this chapter. However, the pitch is stored and is not used until DECPSP is reset.

Notes to Software

This command is provided for backwards compatibility with older printers only. Conforming software should not use DECPSP. Use DECSHORP with Ps = 0 to select the natural pitch for the currently selected font. Use other DECSHORP parameters to select pitches other than the natural pitch.

Use DECPSM with monospaced fonts only.

DECPSP

Proportional Spacing Mode: When set, enables proportional spacing of characters. When reset, selects monospaced printing.

Source: Application **Destination:** Level 3

Format

CSI ? 2 7 h	Sets Proportional Spacing Mode.
CSI ? 2 7 1	Resets Proportional Spacing Mode.

Description

When a proportional font is in use and DECPSP is reset, the printer prints characters on a monospaced grid.

DECPSP has no effect on tab settings.

DECRFS

Request Font Status: Requests a font report.

Source: Print manager **Destination:** Levels 2, 3

Format

CSI Ps " {

Description

The selective parameters for DECRFS are as follows:

0 = Requests both reports (same as 1 followed by 2).
1 = Requests font status (includes all built-in fonts, downloaded fonts).
2 = Requests status of memory bytes available for downloaded fonts.

The host sends this command to request a status report of the fonts available for printing, the memory available for font download, or both.

The parameter Ps selects the type of font status requested.

Notes

Data fields are empty as explained in DECFSR.

Error Handling

If Ps is any value other than 0, 1, or 2, the printer ignores this command.

DECRVEC **Draw Relative Vector:** Draws a vector starting at the active position.

Source: Application **Destination:** Level 3 Extension

Format

CSI Ps1 Pn2 Pn3 SP

Description

The selective parameters for Ps1 are as follows:

Ps1	Action
0	Draws an X (horizontal) line to the right.
1	Draws a Y (vertical) line down.
2	Draws an X (horizontal) line to the left.
3	Draws a Y (vertical) line up.

Numeric parameters provide line length and width:

Pn	Meaning
Pn2	Line length n
Pn3	Line width n

The printer interprets the line length and width as pixels, decipoints or centipoints. The unit is selected using the Select Size Unit (SSU) command. The Positioning Unit Mode (PUM) setting does not affect the unit selected.

The starting point of the line is the current position.

X lines are horizontal with respect to the intended reading page orientation, and Y lines are vertical with respect to the intended reading page orientation.

The DECRVEC command does not change the active position. It is not affected by the First Character Flag.

Since a vector has length and width, it is considered a filled rectangle. The rectangle is not centered on the endpoints. A vector drawn from position (X,Y), with a length of L = (Pn2 - 1) and a width of W = (Pn3 - 1), has the four corners listed in the following table.

Ps1	Upper Left	Upper Right	Lower Left	Lower Right
0	X,Y	X+L,Y	X,Y+W	X+L,Y+W
1	X,Y	X+W,Y	X,Y+L	X+W,Y+L
2	X-L,Y	X,Y	X-L,Y+W	X,Y+W
3	X,Y-L	X+W,Y-L	X,Y	X+W,Y

Error Handling

Relative vectors may extend beyond the limit bounds (left right, top, and bottom margins). If the vector extends beyond the printable area, it is clipped at the edge of the printable area.

DECRVEC **(continued)**

If the requested length is less than 1 pixel long (after conversion to pixel units), the printer draws a line I pixel long. If the requested line is less than 1 pixel wide, the printer draws a line 1 pixel wide.

DECSHORP **Set Horizontal Pitch:** Selects character spacing for monospaced fonts.

Source: Application **Destination:** Levels 1, 2, 3

Format

CSI Ps w

Description

The DECSHORP command determines the number of characters/inch (pitch) that the printer uses when Pitch Select Mode (DECPSM) is reset. If DECPSM is set, the printer saves the DECSHORP parameter.

The selective parameters for DECSHORP are as follows:

Ps	Selection
0	Determined by current font.
1	720 centipoints (10 cpi)
2	600 centipoints (12 cpi)
3	550 centipoints (13.2 cpi)
4	440 centipoints (16.5 cpi)
5	1440 centipoints (5 cpi)
6	1200 centipoints (6 cpi)
7	1090 centipoints (6.6 cpi)
8	870 centipoints (8.25 cpi)
9	480 centipoints (15 cpi)
11	420 centipoints (approx. 17.1 cpi, or 14/240 in.
12	840 centipoints (approx. 8.5 cpi)
13	400 centipoints (18 cpi)
14	800 centipoints (9 cpi)
15	700 centipoints (approx. 10.3 cpi)

There may be printer limitations on pitch based on resolution restrictions. If fallbacks are used, however; the resulting characters are the same size or smaller than those requested. See the discussion of horizontal resolution in the Programming Supplement for the actual pitches supported.

Side Effects

Execution of DECSHORP produces the following side effects:

- Sets the Left Margin Position to the origin.
- Sets the Right Margin Position to the right printable limit.
- Clears the Right Margin Flag.

DECSHORP **(continued)**

- Sets the Line Home Position equal to the Left Margin Position.
- Sets the Line End Position equal to the Right Margin Position.
- Adjusts horizontal tab stops (multiplies each tab location by the ratio of the new Horizontal Advance Increment over the old RAI). For example, if a horizontal tab stop is set at column 12 with a horizontal pitch of 12 characters/inch, the tab stop stored is I inch from the origin. But if a DECSHORP command changes the pitch to 6 characters/inch, the tab stop moves to 2 inches from the origin in order to retain 12 characters between the origin and the tab stop.
- If the active horizontal position is not a multiple of the new HAI, it is adjusted rightward to the next multiple of HAI.
- DECSHORP affects justification. See Justify (JFY).

Error Handling

All other parameter values cause this command to be ignored except for the bounds and Right Margin Flag resets described under Side Effects. A parameter that is valid but unsupported in a particular printer results in a fallback. See the discussion of horizontal resolution in the Programming Supplement for a list of pitches supported.

DECSHTS **Set Horizontal Tab Stops**: Adds one or more tab stops to the horizontal tab table (max of 16).

Source: Application **Destination:** Level 2

Format

CSI Pn Pn u

Description

Pn is a number of units, depending on Positioning Unit Mode (PUM) and Select Size Unit (SSU).

Each Pn parameter is a selected horizontal tab stop. A maximum of 16 tab stops can be selected in one command–the printer can receive Pn values in any order, it sorts them and places them into the tab table.

The printer sets tab stops relative to the page origin and not to the left margin. Changing the left margin does not change the position of tab stops. Changing the pitch with the Set Horizontal Pitch (DECSHORP) command modifies tab positions to keep the number of columns between tab stops constant.

The printer allows at least one tab per eight columns along the widest paper supported at the smallest built-in monospaced pitch. See the Programming Supplement for the exact number.

Tab stops can be set outside the current margins; however, the printer does not use tab stops beyond the right margin.

DECSHTS **(continued)**

Error Handling

If the printer receives more than 16 tab stops, it sets the first 16 and ignores the rest. If the same tab stop is sent more than once, the printer sets the tab stop once. The printer ignores a sequence sent without tab stop parameters.

When the number of new tab settings exceeds the maximum, the printer discards the tab stops with the highest values.

DECSLPP **Set Lines per Physical Page:** Defines the logical form length. The form length is the vertical size of the printed area on a page.

Source: Application **Destination:** Levels 1, 2

Format

CSI Pn t

Description

This command sets the page length to the physical distance that corresponds to Pn units (lines at the current vertical pitch, decipoints, centipoints, or pixels). Once form length is set, changing the size of the units does not change the form length

If Pn equals 0, the printer sets the form length to the logical paper size. Pn is a number of units, depending on Positioning Unit Mode (PUM) and Select Size Unit (SSU).

The following table lists the parameter values for a small selection of page lengths as a function of vertical pitch. These values are used only when PUM is reset.

Length in Inches	Lines Per Page					
	2	3	4	6	8	12
11/3	N/A	11	N/A	22	N/A	44
8.5/2	N/A	N/A	17	N/A	34	51
8.5	17	N/A	34	51	68	102
11	22	33	44	66	88	132
14	28	42	56	84	112	168
21	42	63	84	126	168	252

Where N/A is indicated, the length is riot selectable while the indicated vertical pitch is in effect. If it is selected using another vertical pitch and a subsequent pitch change occurs, page lengths of a non-integral number of lines may result. Page wrap occurs after the last whole line.

The form length limits the range of possible settings for the Set Top and Bottom Margins (DECSTBM) command.

Side Effects

The printer resets the top margin to I and the bottom margin to the printable area when changing page length. DECSLPP also resets the vertical format bounds to the margins.

DECSLPP affects justification. See Justify (JFY).

DECSLPP **(continued)**

Error Handling

If the Pn parameter is greater than the maximum size for the paper and origin, then the printer sets the form length to the maximum size for the paper and origin

Notes to Software

Use DECSLPP only at the top of a new page.

DECSLRM **Set Left and Right Margins:** Sets the horizontal margins.

Source: Application **Destination:** Levels 2, 3

Format

CSI Pn1 Pn2 s

Description

Pn1 is a decimal value that specifies the left margin position.

Pn1	Meaning
0	Leave margin unchanged.
n	Set left margin to n units.

The unit for Pn1 and Pn2 is selected using the Positioning Unit Mode (PUM) and Select Size Unit (SSU) commands.

The printer places data only within the left and right margins, with the following exceptions:

- Draw Vector (DECVEC) and Draw Relative Vector (DECRVEC) draw lines outside the margins.
- During justification, if the required spacing between words is less than the specified minimum width of the space character, text may exceed the right margin.
- If margins are less than one Horizontal Advance Increment (HAI) apart, text may exceed the right margin.

The printer sets the margins relative to the page origin, as set by Origin Placement Mode (DECOPM). Changing the page origin causes the margins to move.

Changing right and left margins does not affect horizontal tab stops. Active position is only affected if it is outside the new margins. See Error Handling.

Select Horizontal Pitch (DECSHORP), Page Format Select (PFS), Variable Page Format Select (DECVPFS), and the reset commands affect margin settings.

Side Effects

DECSLRM sets the Line Home Position equal to the Left Margin Position and the Line End Position equal to the Right Margin Position.

DECSLRM affects justification. See Justify (JFY).

DECSLRM **(continued)**

Error Handling

If the active position is less than the left margin, then the printer sets the active position to the new left margin.

If the active position is greater than the right margin, the printer sets the Right Margin Flag.

If Pn2 is to the right of the right printable limit, the printer sets the right margin to the right printable limit.

If Pn1 is greater than or equal to Pn2, the printer ignores the command, except for the side effects listed above.

If DECOPM is set, characters that precede the left printable limit are not printed.

DECSLRM Set Left and Right Margins

Notes to Software

Margins can be changed or reset as a side effect of other actions. Also, changing the origin with DECOPM changes the locations of the left and right margins with respect to the paper.

Side Effects

DECSNC causes a conditional Sheet Feed. The selected parameter affects all subsequent sheets.

If Pn equals 0, the printer sets Pn to 1.

A maximum of 99 copies can be selected. If Pn is greater than 99, the printer sets Pn to 99.

DECSTBM **Set Top and Bottom Margins:** Sets the vertical margins.

Source: Application **Destination:** Levels 2, 3

Format

CSI Pn1 Pn2 r

Description

Pn1 is a decimal value that specifies the top margin position.

Pn1	Meaning
0	Leave margin unchanged.
n	Set top margin to n units.

Pn2 is a decimal value that specifies the bottom margin position.

Pn2	Meaning
0	Leave margin unchanged.
n	Set bottom margin to n units.

The unit for Pn1 and Pn2 is selected using the Positioning Unit Mode (PUM) and Select Size Unit (SSU) commands.

DECSTBM **(continued)**

The printer places data only within the top and bottom margins, with the following exceptions:

• Draw Vector (DECVEC) and Draw Relative Vector (DECRVEC) draw lines outside the margins.

• Partial Line Down (PLD) may print part of a character below the bottom margin.

• Partial Line Up (PLU) may print part of a character above the top margin

- The Superscript and Subscript attributes set by Select Graphic Rendition (SGR) can print characters above the top margin.
- If the margins are less than one character height apart, text may exceed the bottom margin.
- If the active position is less than one character height from die top margin and the First Character Flag is not set, text may exceed the top margin.

The printer sets the margins relative to the page origin, as set by Origin Placement Mode (DECOPM). Changing the page origin causes the margins to move.

Changing the top and bottom margins does not affect vertical tab stops. The active position is affected only if it is outside the new margins.

Set Lines per Physical Page (DECSLPP), Page Format Select (PFS), Variable Page Format Select (DECVPFS), and the reset commands affect margin settings.

Side Effects

DECSTBM sets the Page Home Line equal to the top margin and Page End Line equal to the bottom margin.

DECSTBM affects justification. See Justify (JFY).

Error Handling

If the active position is above the new top margin, then the printer sets the active position to the new top margin, and sets the First Character Flag.

If the active position is below the new bottom margin, the printer sets the active position to the new bottom margin.

If Pn2 is greater than the form length, the printer sets the bottom margin to the form length.

If Pn1 is greater than or equal to Panama, the printer ignores the command, except for the side effects listed above.

If DECOPM is set, characters above the top printable limit are not printed.

DECSTBM **(continued)**

Notes to Software

Margins can be changed or reset as a side effect of other actions. Also, changing the origin with DECOPM changes the locations of the top and bottom margins with respect to the paper

DECSTBM should be used only on a new page.

DECSTR **Soft Terminal Reset:** Resets the initial state values in the printer. Also returns to DEC PPL3 regardless of the power-up protocol selected.

Source: Application, Print manager **Destination:** Levels 1, 2, 3

Format

CSI Pn p Pn (if present) must be 0.

Description

DECSTR is processed synchronously with the rest of the data stream. The printer sets all the Initial State Values listed in the Programming Supplement to the "DECSTR" conditions.

The printer does not run self-test, change the current communication settings, or clear the input buffer.

Side Effects

DECSTR resets Printer Status Report (DSR) events, including communication failure and input buffer overflow.

The printer performs a conditional Form Feed.

DECSTR affects justification. See Justify (JFY).

See Select Other Coding System (SOCS) when an alternate protocol is in use.

Error Handling

Any parameters received with DECSTR are ignored.

DECSTR Soft Terminal Reset

Notes to Software

It is recommended that you send this command with no parameter. Although the DEC PPL3 parsing rules allow a parameter in any sequence, this sequence is traditionally sent without one. Older Digital printers may not accept the 0 parameter.

DECSVTS

Set Vertical Tab Stops: Adds one or more tab stops to the vertical tab table (max of 16).

Source: Application **Destination:** Level 2

Format

CSI Pn ! p

Description

Pn is a number of units, depending on Positioning Unit Mode (PUM) and Select Size Unit (SSU).

Each Pn parameter is a selected vertical tab stop. A maximum of 16 tab stops can be selected in one command. The printer can receive Pn parameters in any order; it sorts them and places them into the tab table.

The printer sets tab stops relative to the page origin and not to the top margin. Changing the top margin does not charge the position of tab stops. Changing the pitch with Set Vertical Pitch (DECVERP) modifies tab positions to keep the number of lines between tab stops constant.

The printer allows at least one tab per line along the longest paper supported at the smallest built-in line spacing.

Tab stops can be set outside the current margins; however, the printer does not use tab stops beyond the bottom margin.

Error Handling

If the printer receives more than 16 tab stops, it sets the first 16 and ignores the rest. If the same tab stop is sent more than once, the printer sets the tab stop once. The printer ignores a command sent without tab stop parameters.

When the number of new tab settings exceeds the maximum, the printer discards the tab stops with the highest values.

DECVEC **Draw Vector:** Draw a vertical or horizontal line.

Source: Application **Destination:** Level 3 Extension

Format

CSI Ps1 ; Pn2 ; Pn3 ; Pn4 ; Pn5 ! |

Description

The selective parameter options are as follows:

Ps1	Action
0	Draw X (horizontal) line.
1	Draw Y (vertical) line.

Select the numeric parameters as follows:

Pn	Meaning
Pn2	X start position
Pn3	Y start position
Pn4	Line length
Pn5	Line width

DECVEC does not modify the active position.

The unit for numeric parameters is selected using the Select Size Unit (SSU) command Positioning Unit Mode (PUM) has no effect on DECVEC unit size.

For an X line, Pn4 specifies horizontal length and Pn5 specifies vertical width. For a Y line, Pn4 specifies vertical length and Pn5 specifies horizontal width. Since a vector has length and width, it is considered a filled rectangle. The rectangle is not centered on the endpoints. DECVEC rectangles are positioned identically relative to the endpoints as relative vectors. See DECRVEC.

Error Handling

If Ps1 is any value other than 0 or 1, the entire command is ignored.

Missing parameters are interpreted as 0. If the printer receives a DECVEC command with too many parameters, the first five are used and others are ignored.

If the requested line is less than 1 pixel long, the printer draws a line 1 pixel long. If the requested line is less than 1 pixel wide, the printer draws a line 1 pixel wide.

Do not rely upon the defaults for Pn4 and Pn5. Define the vector to be at least 1 pixel long and 1 pixel wide. Poor quality may result when processing very short or very thin vectors.

Margin settings do not affect vectors. DECVEC may draw lines that extend beyond the margins, but not out of the printable area. Vectors that extend outside of the printable area are clipped.

DECVERP **Set Vertical Pitch:** Selects line spacing

Source: Application Destination: Levels 1, 2

Format

CST Ps 2

Description

Selects the number of lines printed for each inch on a page. Changing the vertical pitch changes the white space between lines, not the size of the character. If the number of lines/inch is increased, the amount of white space is decreased between the lines.

The selective parameter values for DECVERP are as follows:

Ps	Decipoints	Lines/Inch
0	120	6
1	120	6
2	90	8
3	60	12
4	360	2
5	240	3
6	180	4
10	Same as Ps = 11	
11	115	66 / A-size printable area
12	86	88 / A-size printable area
13	57	132 / A-size printable area
14	346	22 / A-size printable area
15	230	33 / A-size printable area
16	172	44 / A-size printable area

In some printers, the printable area is slightly smaller than the physical paper size in use. The reduction is never more than 1/4 inch on each edge, or a total of 1/2 inch. The DECVERP parameters 11-16 are the counterparts to 1-6. They are intended to support traditional lines/page requirements on a print area that is slightly less than 11 inches long.

The exact vertical pitch produced for parameters 11-16 is printer-dependent. The result is defined as lines/page on the printable area defined for portrait printing on A-sized paper for that printer.

Pitch Select Mode (DECPSTM) does not affect DECVERR

Side Effects

Vertical tab stops are adjusted in order to retain a constant number of lines between vertical tabs. For example, if a vertical tab stop is set at 12 lines with a vertical pitch of 6 lines/inch, the tab stop stored is 2 inches from the origin. But if a DECVERP command changes the pitch to 12 lines/inch, the tab stop moves to 1 inch from the origin in order to retain 12 lines between the origin and the tab stop.

DECVERP does not affect the active position, top and bottom margins, or the page length.

DECVERP **(continued)**

Error Handling

If the vertical pitch is set greater than the page length, the printer images one line/page.

If Ps is invalid, the command is ignored.

DECVTS **Vertical Tab Set:** Executes Vertical Tab Set (VTS).

Source: Application Destination: Level 2 (outmoded command)

Format

ESC 3

Notes to Software

This command is included for backwards compatibility with older printers only. Conforming software should not use this command.

DSR **Device Status Request:** Requests error status or cursor position.

Source: Print manager Destination: Levels 1, 2, 3

Format

CSI Ps n

CSI ? Ps n Selects Digital private status reporting state.

Description

In response to a DSR command, the printer sends a single brief or extended status report. If you enable unsolicited reports, the printer sends additional reports whenever any reportable status condition changes state.

The printer processes the DSR request (except for cursor position reports) immediately upon receipt, asynchronously to the rest of the data stream. This allows the printer to respond to the request when an error has halted the printing process and the input buffer is full.

The selective parameters for the Printer Status Request command are as follows:

Ps	Selection
0 or 5	Sends an extended status report.
6	Sends a Cursor Position Report (CPR).
?1	Disables all unsolicited status reports.
?2	Enables brief unsolicited status reports, sends extended status report.
?3	Enables extended unsolicited status reports, sends extended status report.

The host sends the Printer Status Request command to request a status report of detected errors or to report the current cursor position. There are two types of reports - extended and brief The brief report sends generic error codes. The extended report sends both generic and specific error codes.

The number of DSR requests the printer can process is limited only by the transmission time of each report.

Error Handling

If Ps has a value other than those shown, the printer ignores the entire command.

DSR

Device Status Report: Reports error status. The printer sends this report:

- In response to an error condition (if unsolicited reports are enabled)
- In response to a Printer Status Request (DSR) with Ps = 0, 5, ?2, or ?3.

Unsolicited status reports are sent upon completion of the current page.

Source: Printer **Destination:** Print manager

Brief Report Format

CSI Ps n

CSI 3 n	Error
CSI 30 n	No errors

Extended Report Format

Brief report followed by:

CSI Pn1 ; Pn2 ; ... ; Pnn

Brief Report Description

The brief report parameters are as follows:

Ps	Meaning
3	Error
30	Error.

Extended Report Description

Each Pn value is an error code of up to three digits. Error codes occur in pairs: a generic code, followed by a specific code.

CSI ? 36 ? 216 n	Printer paper out error
CSI ? 26 ? 212 n	Non paper error

Notes

If unsolicited reports are enabled, errors are reported as they occur.

If no errors occurred, the printer returns a generic "no error" code. This code varies depending on the printer configuration.

If an event error occurs when unsolicited reports are disabled, the event is stored and reported on the next request. If a state error occurs when unsolicited reports are disabled, an error report is generated on the next request only if the error condition still exists - for example, the cover is open or the printer is off line.

If enabled, the printer transmits a report before going offline in response to a serious engine error.

GSM

Graphic Size Modification: Modifies the Current Font Definition height or width, established by the Graphic Size Selection (GSS) command.

Source: Application **Destination:** Level 3

Format

CSI Pn1 Pn2 SP B

Description

Pn1 is a decimal value that specifies the height of the character as a percentage of die height selected by the GSS command.

Pn1	Meaning
0	Set height to 100% of GSS.
n	Set height to Ps% of GSS.

Pn2 is a decimal value that specifies the width as a percentage of the width set by the GSS command.

Pn2	Meaning
0	Sets width to 100% of width set by GSS.
n	Percentage of the width set by GSS.

The modification remains in effect until the next GSM or Graphic Size Selection (GSS) command occurs in the data stream, or until reset or power down.

The GSM command can be used in the middle of a line without affecting the alignment of characters along the baseline.

Side Effects

The GSM command affects line spacing only when a font-dependent Vertical Advance Increment (VAI) is in effect.

Notes to Software

If you are not using a font-dependent VAI, or if you switch to taller characters in the middle of a line, use Select Vertical Spacing (SVS) to accommodate the change in character size.

GSS

Graphic Size Selection: Establishes the height and width for the Current Font Definition.

Source: Application **Destination:** Level 3

Format

CSI Pn SP C

Description

Select Pn as follows:

Pn	Meaning
0	Sets height to 100 decipoints.
n	Sets height to Pn units.

The unit size depends on the Select Size Unit (SSU) command setting. Positioning Unit Mode (PUM) has no affect on GSS.

The height of a font implicitly defines the width.

The GSS selection remains in effect until the next occurrence of GSS in the data stream, reset, or power down. The height and width selected may be further modified by Graphic Size Modification (GSM).

The GSS command can be used in die middle of a line without affecting the alignment of characters along the baseline.

Side Effects

GSS sets GSM to 100;100.

The GSS command affects line spacing only when font-dependent spacing is selected.

Notes to Software

If you are not using font-dependent spacing, or if you switch to taller characters in the middle of a line, use Select Vertical Spacing (SVS) to accommodate the change in character size.

HPA

Horizontal Position Absolute: Moves to a new active horizontal position. Motion occurs either to the right or to the left.

Source: Application **Destination:** Levels 2, 3

Format

CSI Pn 9/11 - 6/0

Description

Select Pn as follows:

Pn	Meaning
0	Interpreted as 1
n	Number of units, depending on Positioning Unit Mode (PUM) and Select Size Unit (SSU).

When lining attributes are invoked by Select Graphic Rendition (SGR), HPA underlines, double underlines, overlines, or strikes through from the current position to the target position.

The First Character Flag has no effect on HPA.

Error Handling

If Pn is to the left of the Left Margin Position, the printer sets the horizontal position to the Left Margin Position.

Sets the right margin flag if the Pn is greater than the right margin.

Clears the right margin flag if the Pn is less than or equal to the right margin.

HPB

Horizontal Position Backward: Moves the active position to the left a specified number of units.

Source: Application **Destination:** Level 3

Format

CSI Pn

Description

Select Pn as follows:

Pn	Meaning
0	Interpreted as 1.
n	Number of units, depending on Positioning Unit Mode (PUM) and Select Size Unit (SSU).

The HPB command can place the active horizontal position to the left of the Line Home Position or to the right of the Line End Position.

When lining attributes are invoked by Select Graphic Rendition (SGR), HPB underlines, double underlines, overlines, or strikes through from the current position to the target position.

The First Character Flag has no effect on HPB.

Error Handling

If the resulting active position would be to the left of the Left Margin Position, the printer sets the horizontal position to the Left Margin Position.

When the Right Margin Flag is set, the command is ignored.

HPR

Horizontal Position Relative: Moves the active position to the right a specified number of units.

Source: Application **Destination:** Levels 2, 3

Format

CSI Pn a

Description

Select Pn as follows:

Pn	Meaning
0	Interpreted as 1
n	Number of units, depending on Positioning Unit Mode (PUM) and Select Size Unit (SSU).

When lining attributes are invoked by Select Graphic Rendition (SGR), HPR underlines, double underlines, overlines, or strikes through text from the current position to the target position.

The First Character Flag has no effect on HPB.

Error Handling

If the resulting position would be to the right of the Right Margin Position, the printer sets the horizontal position equal to the Right Margin Position and sets the Right Margin Flag.

When the Right Margin Flag is set, the command is ignored.

If Pn moves the current horizontal position to the left of the left margin, the active position is set to the left margin.

Double underline and strike through are not supported.

LNM

Line Feed/New Line Mode: Instructs the printer to move to the Line Home Position on the next line upon receipt of a Line Feed (LF).

Source: Print manager **Destination:** Levels 2, 3

Format

CSI 2 0 h	LF acts as New Line
CSI 2 0 1	LF acts as Line Feed

Description

If LNM is set and a Line Feed is received, the active position advances to the Line Home Position of the next line. If LNM is reset and a Line Feed is received, the active position advances to the same horizontal position on the next line.

LS*/LS*R/SS*

Locking and Single Shifts: These sequences invoke the GO-G3 character sets into GL or GR.

Source: Application Destination: Levels 1, 2, 3

Format

Name	Mnemonic	Sequence	Function
Single Shift 2	SS2	ESC N (1B 4E)	The character that follows the SS2 is selected from G2.
Single Shift 3	SS3	ESC O (1B 4F)	The character that follows SS3 is selected from G3.
Shift Out	SO	SO (0E)	See Locking Shift 1.
Shift In	SI	SI (0F)	See Locking Shift 0.
Locking Shift 0	LS0	SI (0F)	G0 becomes the active GL character set.
Locking Shift 1	LS1	SO (0E)	G1 becomes the active GL character set.
Locking Shift 2	LS2	ESC n (1B 6E)	G2 becomes the active GL character set.
Locking Shift 3	LS3	ESC o (1B 6F)	G3 becomes the active GL character set.
Locking Shift 1 Right	LS1R	ESC ~ (1B 7E)	G1 becomes the active GR character set.
Locking Shift 2 Right	LS2R	ESC } (1B 7D)	G2 becomes the active GR character set.
Locking Shift 3 Right	LS3R	ESC | (1B 7C)	G3 becomes the active GR character set.

There is no LS0R.

Description

See page 198 for more information on designating and invoking character sets.

The effect of a single shift (SS2 or SS3) continues only for the first printable GL character that follows the single shift sequence.

The effect of a locking shift (LS2, LS3, LS1R, LS2R, or LS3R) continues indefinitely; that is, until another locking shift changes the effect, or until reset or power down.

PUM

Positioning Unit Mode: Establishes the unit for the numeric parameters of certain control functions.

Source: Application **Destination:** Level 3

Format

CSI 1 1 h	Sets PUM.
CSI 1 1 1	Resets PUM.

Description

When PUM is set, the setting of Select Size Unit (SSU) determines unit size: decipoint, centipoint, or pixels. When PUM is reset, unit size is defined as columns in horizontal spacing commands and lines in vertical spacing commands. Actual column widths and line heights are set by control functions or are taken from the currently selected font.

The Positioning Unit Mode (PUM) establishes the unit for the numeric parameters of the following sequences:

- HPA, HPB, HPR
- VPA, VPB, CUU
- VPR, DECSHTS, DECSVTS
- DECSLPP, DECSTBM, DECSLRM

RIS

Reset to Initial State: Resets printer state variables to their initial values. RIS has the same effect as Soft Terminal Reset (DECSTR).

Source: Print manager **Destination:** Levels 1, 2, 3

Format

ESC c 1/11 6/3

Description

See the DECSTR command for details.

Notes to Software

This command is included for backwards compatibility with older printers only. Conforming software should not use this command.

ESC c is reserved for other uses in some protocols.

SCS

Select Character Set: Designates a graphic character set into G0, G1, G2, or G3.

Source: Application **Destination:** Levels 1, 2, 3

Format

ESC I1 I2 ... In F

Description

I1 is an intermediate character selected from the following table.

I1 Character	Hex Code	Map into G-set
94-Character Sets		
(Left parenthesis	28	G0
) Right parenthesis	29	G1
* Asterisk	2A	G2
+ Plus sign	2B	G3
96-Character Sets		
- Minus sign	2D	G1
. Period	2E	G2
/ Slash	2F	G3

The following table lists the character set designating characters. These character sets are selected using the identifier as F or I2 F in the SCS sequence.

Character Set	I_2F Designator Characters	Hex Code
94-Character Sets		
British	A	41
ASCII	B	42
DEC Dutch	4	34
DEC Finnish	5	35
French	R	52
DEC French-Canadian	9	39
German	K	4B
DEC Hebrew Supplemental	“4	22 34
DEC 7-bit Hebrew	%=	25 3D
ISO Italian	Y	59
Legal	%4	25 34
JIS Katakana	I	49
JIS Roman	J	4A
DEC Norwegian/Danish	6	36
ISO Spanish	Z	5A
DEC Swedish	7	37
DEC Swiss	=	3D
Norwegian/Danish	`	60
DEC Supplemental	%5	25 35
DEC Technical	>	3E
DEC Special Graphics	0	30
DEC Portuguese	%6	25 36
User Preference Supplemental[1]	<	3C
96-Character Sets		
ISO Latin-1 Supplemental	A	41
ISO Latin-Hebrew Supplemental	H	48
ISO Latin-9 Supplemental (Euro)	b	62

[1]For compatibility with older printers, set the User Preference Supplemental character set to the DEC Supplemental character set.

The following SCS sequences select Digital character sets as fallbacks. Since Digital reserves the right to redefine these sequences in the future to conform to ISO standards, it is recommended that conforming software not use these sequences but instead use the Digital escape sequences in the previous table to select these sets.

SCS **(Continued)**

SCS Fallbacks				
G0	**G1**	**G2**	**G3**	**Character Set**
ESC (C	ESC) C	ESC * C	ESC + C	Fallback to DEC Finnish
ESC (Q	ESC) Q	ESC * Q	ESC + Q	Fallback to DEC French Canadian
ESC (E	ESC) E	ESC * E	ESC + E	Fallback to DEC Norwegian/Danish
ESC (H	ESC) H	ESC * H	ESC + H	Fallback to DEC Swedish

Error Handling

Do not invoke a 96-character set into GL. This is considered an error condition.

SGR

Select Graphic Rendition (Selecting Attributes): Selects printing attributes, including lining functions, superscript and subscript functions, and emphasis functions.

Source: Application **Destination:** Levels 1, 2, 3

Format

CSI Ps ; Ps ; Ps m	Selects standard attributes.
CSI ? Ps Ps Ps m	Selects Digital private attributes.

Description

Select an attribute using standard SGR parameters as follows:

Ps	Action
0	Turn off all attributes, standard and private.
1	Turn on bold.
3	Turn on slant.
4	Turn on underline, turn off double underline
21	Turn on double underline, turn off underline
22	Turn off bold.
23	Turn off slant.
24	Turn off underline and double underline.
53	Turn on overline.
55	Turn off overline.

Select an attribute using Digital private SGR parameters as follows:

Ps	Action
0	Turn off all private attributes (outmoded parameter.
4	Turn on superscript, turn off subscript.
5	Turn on subscript, turn off superscript.
6	Turn on overline (outmoded parameter).
24	Turn off superscript and subscript.
26	Turn off overline (outmoded parameter).

Notes to Software

Parameter ?0 is provided for backwards compatibility with older printers only (outmoded parameter). Conforming software should not use this parameter. Use parameter 0 instead.

Parameters ?6 and ?26 are provided for backwards compatibility with older printers only (outmoded). Conforming software should not use these parameters. Use parameters 53 and 55 instead.

Using SGR to Select Character Attributes

You can send more than one parameter at a time, separating them with semicolons. Do not mix standard and private parameters in one command.

The printer uses the selected attribute across line and page boundaries until the attribute is turned off or until a reset or power down.

Lining Attributes

Underline, double underline, overline, and strike-through attributes affect all printable characters in the data stream, including:

• Space (SP)

• Horizontal Position Relative (HPR)

• Horizontal Position Backward (HPB)

• Horizontal Position Absolute (HPA)

SGR Select Graphic Rendition - Selecting Attributes

Tabs are riot affected.

The thickness and positioning of the lining attributes depend on the selected font.

The strike-through attribute marks characters for deletion- Legal documents often use the strike-through attribute to indicate words deleted from a previous version of the document. The printer draws a line through the marked characters, in die same manner as underline.

SGR **(Continued)**

All lining attributes are contiguous relative to the baseline of the entire line, even when used on superscript or subscript text. This applies to SGR superscript and subscript only, not to Partial Line Up (PLU) or Partial Line Down (PLD). Do not use underline with PLU and PLD. The result may differ depending on the printer.

Lining attributes extend to cover the full Horizontal Advance Increment (HAI) except for the first and last characters on a justified line. See Justify (JFY).

Superscript and Subscript Attributes

If superscript or subscript is requested, the printer attempts to choose a font with smaller characters. The algorithm used is similar to that used for Graphic Size Modification (GSM) of 50%, applied to the font currently in use. This results in a size reduction only if a smaller compatible font is available. The printer uses the Superscript Vertical Offset (CFFF 3.5.3.1) field to determine the superscript offset from the baseline, and the Subscript Vertical Offset (CFFF 3.5.3.3) field to determine the subscript offset from the baseline.

Line feed distance, Graphic Size Modification (GSM), and active position are not affected by superscript or subscript.

Superscripts and subscripts cannot be nested.

Emphasis Attributes

If bold printing is selected, the printer uses a bold (darker) font from the current type family, if available. Otherwise, it uses an algorithm to produce darker characters. See Chapter 4 for more information on font selection and algorithmic transformations.

When slant printing is selected, the printer uses an italic font file, if available. Otherwise, see the Programming Supplement for more information about built-in algorithmic transformations and the slant algorithm.

Wrapping algorithms apply to the unmodified character Characters that have only the modified part extending outside the margins do not wrap.

SGR

Select Graphic Rendition (Selecting Fonts): Selects a font for printing.

Source: Application **Destination:** Level 3

Format

CSI Ps ; Ps ; Ps ; m Selects standard font.

Description

Use as predefined or as defined by DECATFF.

Once a font has been assigned to one of the SGR font selection parameters (10-19), SGR selects that font for subsequent printing. You can assign a font to an SGR parameter using Assign Type Family or Font (DECATFF) or you can use the default assignments. See DECATFF for specific information on assignment.

If you do not assign a font using DECATFF, the printer uses the default assignments. See the Programming Supplement for the initial state values of SGR parameters.

If you use SGR to select a proportional font, make sure that Proportional Spacing Mode (DECPSP) is set.

The select font command can be used anywhere in the data stream. The selected font remains in effect until any of die following occurs:

- The printer receives another select font command (SGR 10-19).
- The font assigned to the currently selected SGR parameter is changed (DECATFF).
- The printer is reset or powered down.

A character set change may result in a temporary font change.

Side Effects

If the font is assigned to the selected SGR parameter by font collection plus, the printer sets Proportional Spacing Mode (DECPSP) according to byte 8 of the font ID.

SHS

Set Horizontal Spacing: Selects character spacing for monospace printing.

Source: Application Destination: Level 3

Format

CSI Ps SP K

Description

Determines the Horizontal Advance Increment (HAI). If Proportional Spacing Mode (DECPSP) is set, SHS has no immediate effect.

Select the SHS parameter as follows:

Ps	Centipoints	Characters/Inch
0	720	10
1	600	12
2	480	15
3	1200	6

SHS does not affect character size or horizontal tab stops.

The printer saves the HAI value upon receipt of SHS even when DECPSP is set; however, it does not use the value until DECPSP is reset.

The HAI value chosen remains in effect until one of the following occurs:

- Another SHS command
- A Set Horizontal Pitch (DECSHORP) command
- A Spacing Pitch Increment (SPI) command
- Reset or power down

SnC1R/DEC*C1 **C1 Transmit/Receive:** Defines the type of C1 processing or encoding.

Format

Command	Sequence	Meaning
DECTC1	ESC SP 6	Process 7-bit ESC Fe sequences. If 8-bit C1 control codes are received, drop the 8t^h bit and process as C0.
DECAC1	ESC SP 7	Process 7-bit ESC Fe sequences and 8-bit C1 control codes.
S7C1T	ESC SP F	Transmit C1 control codes as ESC Fe sequences. This is the power-on state.
S8C1T	ESC SP G	Transmit C1 control codes as C1 codes.

Description

These sequences define how C1 codes are encoded from the host to the printer or from the printer to the host. The sequences select whether the interface uses 8-bit encoding or 7-bit equivalent (ESC Fe) encoding. These equivalents are given in the third column of the table on page 196 .

These sequences are processed in sequence with all other data. Therefore, it is recommended that software send these sequences before all other commands to prevent confusion.

If the printer is set to 7 data bits via a setup feature or the front panel, this sequence is ignored.

The printer recognizes either 8 bit or 7-bit equivalent encoding from the host. However, it always transmits using the 7-bit equivalent encoding.

SPI

Spacing Pitch Increment: Determines the Vertical Advance Increment (VAI) or the Horizontal Advance Increment (HAI).

Source: Application **Destination:** Level 3

Format

CSI Pn1 Pn2 SP G

Description

SPI gives maximum flexibility in adjusting character and line spacing. If Proportional Spacing Mode (DECPSP) is set, the vertical component of SPI has no immediate effect.

Select Pn1 as follows:

Pn1	Meaning
0	VAI size determined by current font.
n	VAI size in units, depending on Positioning Unit Mode (PUM) and Select Size Unit (SSU).

Select Pn2 as follows:

Pn2	Meaning
0	HAI size determined by current font.
n	HAI size in units, depending on PUM and SSU.

The printer saves the HAI value upon receipt of SHS even when DECPSP is set; however, it does not use the value until DECPSP is reset.

The RAI and VAI values chosen remain in effect until one of the following occurs:

- Another SPI command
- A Set Horizontal Pitch (DECSHORP) command
- A Set Horizontal Spacing (SHS) command
- Reset or power down

The SPI setting for vertical spacing remains the same until one of the following commands is received:

- Another SPI command
- A Set Vertical Spacing (SVS) command
- A Set Vertical Pitch (DECVERP) command
- Reset or power down

If Pn1 = 0 or Pn2 = 0, the printer uses the default vertical and horizontal spacing for the selected font See Sect-ion 3.2.1.2 for more information on font-dependent spacing.

SSU

Select Size Unit: Selects a unit of measurement for spacing parameters.

Source: Application **Destination:** Level 3

Format

CSI Ps SP I

CSI ? Ps SP I Selects a Digital private parameter.

Description

Select an SSU parameter as follows:

Ps	Action
2	Selects decipoints, 1/720 inch.
7	Selects pixels (printer-specific
?1	Selects centipoints, 1/7200 inch

SSU selects decipoints, centipoints, or pixels as the unit for certain control functions, as noted under the individual commands in this chapter.

In some cases SSU works with Positioning Unit Mode (PUM) to determine the unit used. If PUM is reset, characters are used, regardless of the SSU setting. If PUM is set, decipoints, centipoints, or pixels are used, based on the SSU setting.

In other cases SSU is used alone, and PUM has no effect.

SSU remains in effect until the printer receives another SSU command or until reset or power down. SSU only affects sequences that follow it in the data stream.

Error Handling

Selective parameters other those shown above are ignored.

SVS

Set Vertical Spacing: Selects line spacing for monospace printing.

Source: Application **Destination:** Level 3

Format

CSI Ps SP L

Description

Determines the Vertical Advance Increment (VAI). If Proportional Spacing Mode (DECPSP) is set, SVS has no immediate effect.

Select the SVS parameter as follows:

Ps	Centipoints	LPI
0	1200	6
1	1800	4
2	2400	3
3	600	12
4	900	8
5	1416	6/30mm, 5mm
6	2136	4/30mm, 7.5mm
7	2856	3/30mm, 10 mm
8	720	12/30mm, 2.5 mm
9	3600	2, ½ in.

SVS does not affect character size or vertical tab stops.

The following table shows the resulting error accumulation over 25 centimeters.

Parameter	Lines	Error 1/300 in.	Error Inches	Error Millimeters
5	50	2.50	1/120	0.2
6	33	13.86	1/21	1.0
7	25	22.00	1/14	2.0
8	100	50.00	1/6	4.0

TBC **Tab Clear:** Clears one or all horizontal or vertical tab stops.

Source: Application **Destination:** Levels 1, 2

Format

CSI Ps Ps 9

Description

Select Ps as follows:

Ps	Meaning
0	Clears one horizontal tab at active column.
1	Clears one vertical tab at active line.
2	Clears all horizontal tabs.
3	Clears all horizontal tabs.
4	Clears all vertical tabs.

If Ps = 0 or Ps = 1, the tab stop is cleared if it coincides exactly with the current active position, regardless of the setting of Positioning Unit Mode (PUM) and regardless of whether the tab stop is on the grid.

See also Horizontal Tab (HT) and Vertical Tab (VT).

Error Handling

Unrecognized parameters are ignored.

VPA **Vertical Position Absolute:** Moves to a new active vertical position. The horizontal position is unchanged. Motion occurs either up or down.

Source: Application **Destination:** Levels 2, 3

Format

CSI Pn d 9/11 *** 6/4

Description

Select the VPA parameter as follows:

Pn	Meaning
0	Interpreted as 1
n	Number of units, depending on PUM and SSU.

Set the active vertical position to Pn units from the origin.

The active position can be moved either up or down on the page with VPA.

If PUM is reset, VPA sets the First Character Flag If PUM is set, VPA clears the First Character Flag.

VPA **(Continued)**

Error Handling

Be aware that VPA interacts with coordinate system bounds.

VPB **Vertical Position Backward:** Moves the active vertical position up by the specified number of units. The horizontal position does not change.

Source: Application **Destination:** Level 3

Format

CSI Pn k

Description

Select the VPB parameter as follows:

Pn	Meaning
0	Interpreted as 1.
n	Number of units, depending on PUM and SSU.

Error Handling

Note that this command interacts with coordinate system bounds.

If the Pn is more than the current vertical position, then the current vertical position is set to top margin and the first character flag is set.

There is no change if Pn is less than 5 decipoints.

VPR **Vertical Position Relative:** Moves the active vertical position down by the specified number of units. The horizontal position does not change.

Source: Application **Destination:** Levels 2, 3

Format

CSI Pn e

Description

Select the VPR parameter as follows:

Pn	Meaning
0	Interpreted as 1.
n	Number of units, depending on PUM and SSU.

VPR leaves the First Character Flag unchanged if PUM is reset. If PUM is set, the First Character Flag is cleared.

PAGE COORDINATE SYSTEM

Before PPL III commands that involve print positioning can be understood, the PPL III page coordinate system must be understood. This section of the PPL III chapter covers the following subjects:

- Coordinate system model
- Active position, positioning controls, and advance increments
- Coordinate system bounds
- Limits of the printable area
- Logical page to physical sheet mapping
- Variable paper size mapping
- Minimum print area size
- Character adjustment using the First Character flag
- Partial line motion
- Side effects of positioning controls
- Conditional Form Feed
- Conditional Sheet Feed
- Page break

The page coordinate system defines a logical page. The relationship between a logical page and physical printed pages is determined by the paper size.

Coordinate System Models

There are two coordinate system models – the character cell model and the point model.

- Character Cell Model: A position comprises an entire character extent. The addressable increment is the entire character.
- Point Model: A position is a dimensionless location and the addressable increment is not directly related to characters.

Character Cell Model

The character cell model specifies the coordinates of a character cell position as the line and character number, starting with character 1 of line 1. This is a simple model used for monospaced presentation. The character cell model is not used for proportionally spaced characters.

Character box: The size of the character as stored in the font. This size cannot be varied by the host software.

Character cell: This is the distance from one character to another in monospaced print mode. This distance can be varied by the host software by changing the height of the current line spacing and the width of the current character spacing. The host software can set the size of the character cell to be larger than, equal to, or smaller than the character box of the font being used. When the size of the character box does not match the size of the character cell, the character is left-justified within the cell.

Point Model

In the point model, the coordinates of a print position are specified in decipoint units (exactly 1/720-inch), centipoint units (exactly 1/7200-inch), or printer-dependent pixels.

The point model is more complex than the character cell model. It requires that a particular location in the character box be specified as the origin of the character box. Subsequent point mode addressing is relative to this origin. The origin, for placement purposes, is on the baseline of the character at the left edge of the character box.

Point mode addressing is enabled by setting the Positioning Unit Mode (PUM). Once enabled, the size of the points, or units, depends on the current setting of the Select Size Unit (SSU). The size units are decipoints or centipoints as described above.

Point Model Has Precedence

In PPL III, both models are supported. Whenever the Character Cell model is used, coordinates are converted to point positions, where the point is the intersection of the left edge of the character box and the baseline.

Origin and Extent

Origin

The page coordinate system is an X-Y system in which the positive X direction is to the right, and the positive Y direction is down. The origin in this coordinate system is (1,1) and not (0,0).

Printable Area

The printable area is the area on the paper where the printer can physically print. The origin may be changed using the DECOPM command. If DECOPM is reset, then the origin is at the corner of the printable area. If DECOPM is set, then the origin is near the corner of the physical page.

Unit Conversions and the Origin

Because the origin is at (1,1) and not (0,0), calculations need to take this translation into account. The formula to convert from centipoints to decipoints (and vice versa) is as follows:

target = ((source-1)*ratio)+1

where target is the coordinate in the new system, source is the coordinate in the old system, and ratio is the size ratio between the two measurement units.

For example, the coordinate system origin is at (1,1) in pixels, decipoints, or centipoints. For a 300 dpi printer, the next diagonal pixel is at (2,2) in pixel units, but at (25,25) in centipoints. Similarly, a decipoint coordinate of (2,2) is at (11,11) in centipoints.

Positioning and Movement

Active Horizontal Position: This is the horizontal position where printing will occur next. It is updated after each print operation.

Active Vertical Position: This is the vertical position where printing will occur next. It is updated after each print operation.

Horizontal Advance Increment (HAI): This is added to the previous Active Horizontal Position to determine the next Active Horizontal position at the conclusion of a print operation. The classes of HAI are:

- Fixed
- Font-dependent
- Proportional

Vertical Advance Increment (VAI): This is added to the previous Active Vertical Position to determine the next Active Vertical position at the conclusion of a print operation. The two classes of VAI are:

- Fixed
- Font-dependent

Horizontal Advance Increments

Fixed HAI

Fixed horizontal motion does not vary from character to character or font to font. The HAI is explicitly defined by control functions.

A fixed HAI is selected by any of the following:

- Pitch Select Mode (DECPSM) reset, and Set Horizontal Pitch (DECSHORP) with last valid Ps ≠ 0
- Spacing Increment (SPI) with last valid Pn2 ≠ 0
- Set Horizontal Spacing (SHS) using any valid Ps

Control Function	Type	Margin effect	Parameter Used	Flags
Autowrap	Relative	-	All	Clears PLU/PLD count and Superscript/Subscript count.
Backspace	Relative	Not possible beyond left margin	All	Active only if right margin flag is cleared
Carriage Return	Absolute	-	All	Clears RMF
Cursor Up	Relative	Not possible to move above top margin	Parameter value more than 5 decipoints	FCF Sets if cursor forced above top margin
Graphics Carriage Return	Absolute	Cursor moves back to Graphics left margin (left margin where graphics starts).	All	-
Graphics Next line	Relative	Forces Graphics carriage return, New line beyond bottom margin leads to Form Feed	All	-
Form Feed	Absolute	-	All	Sets FCF Clears RMF Clears PLU/PLD and Superscript/Subscript
Horizontal Position Absolute	Absolute	Movement is possible with in left and right margin.	All	Pn less than right margin Resets RMF Other Pn values Sets the RMF
Horizontal Position Backward	Relative	Maximum backward movement possible is up to left margin.	All	Command ignored if RMF is Set
Horizontal Position Relative	Relative	New position beyond right margin leads to autowrap if autowrap is ON.	All	If autowrap OFF then new position beyond right margin Sets RMF
Horizontal Tab	Absolute	If there is no tabs in the tab table or no valid tab between the current position and RM then HT brings the cursor to right margin (RM).	All	HT beyond right margin Sets RMF
Index	Relative	IND in bottom margin leads to FF	All	Clears superscript/subscript and PLU/PLD count
Line Feed	Relative	LF in bottom margin leads to FF	All	Clears superscript/subscript and PLU/PLD
Next Line	Relative	NEL in bottom margin leads to FF	All	Clears RMF Clears superscript/subscript and PLU/PLD
Partial Line Down	Special	Can go down to one PLD position below bottom margin	All (Minimum PLU/PLD count value is -255)	Decrements the PLU/PLD count

Control Function	Type	Margin effect	Parameter Used	Flags
Partial Line Up	Special	Can go up to one PLU position above top margin	All (Maximum PLU/PLD count value is 255)	Increments the PLU/PLD count
Reverse Index	Relative	Can go up to top margin	All	Clears PLU/PLD count and Superscript/Subscript count. Resulting vertical position above top margin Sets FCF.
Vertical Position Absolute	Absolute	Maximum vertical movement possible is up to bottom margin. Resulting vertical position more than bottom margin will set the active vertical position to bottom margin	All	Clears PLU/PLD count and Superscript/ Subscript count.. In RESET mode command sets the FCF flag.
Vertical Position Backward	Relative	Can go up to top margin.	All	Clears PLU/PLD count and Superscript/Subscript count. Sets the FCF if the resulting vertical position is above top margin.
Vertical Position Relative	Relative	Performs the FF if resulting vertical position is below bottom margin.	All	Clears PLU/PLD count and Superscript/Subscript count. In RESET mode command sets the FCF flag.
Vertical Tab	Absolute	If there is no tabs in the tab table or no valid tab between the current position and BM then VT brings the cursor to bottom margin (BM).	All	Clears PLU/PLD count and Superscript/Subscript count. Sets the FCF

Bounds

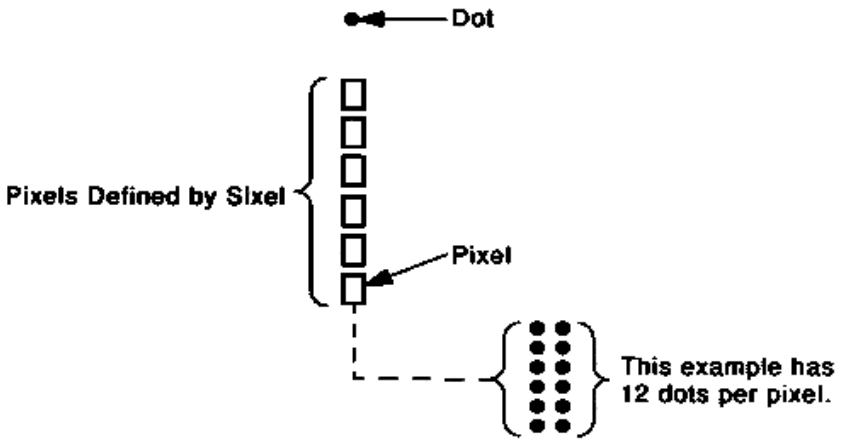
- Page Home Line is same as Top Margin Line
- Page End Line is same as Bottom Margin Line
- Line Home Position is same as Left Margin Position
- Line End Position is same as Right Margin Position

SIXEL GRAPHICS

The Sixel Graphics protocol provides the ability for the printer to receive and print black and white bitmap data at various sizes to create graphics images.

Terminology and Concepts

The bitmap data for producing a graphics image is divided into horizontal scan lines, each of which is **six** bitmap **el**ements high. The term for the bitmap data is **raster**. Prior to sending the data, the user can define horizontal and vertical spacing between elements. The smaller the spacing, the finer the grain and the higher the quality of the image will be.



Pixels A pixel is the logical rectangular image area defined by each bit of graphics data that you send.

Sixel A group of six pixels arranged vertically and sent as a group.

Grid The positions on the page where the printer places pixels.

Pixel Aspect Ratio The relationship between the length of the pixel to its width. For example, a square pixel has a pixel aspect ratio of 1 to 1 (or 100 to 100). A pixel twice as high as it is wide has a pixel aspect ratio of 2 to 1 (or 200 to 100).

Pixel Spot The actual area imaged for each pixel. The shape and size of a pixel spot is printer-dependent and is only approximately related to grid size.

Dot The smallest unit that can be displayed on the printer. Several dots may be required to represent a single pixel as a pixel-spot.

Picture Definition The data describing the image, including grid size, pixel aspect ratio, and the encoded raster. The picture definition does not include formatting information, such as position or actual presentation size.

Sixel Control Codes Within the picture definition, sixel control codes provide additional information beyond the encoded raster, such as line breaks.

General Sixel Graphics Operation

Sixel Graphics printing consists of setting the context and attributes for the pixels and then printing the received pixels in adjacent grid positions. The following are essential elements of the Sixel Graphics print process.

- Selection of Sixel Graphics using the Sixel Printer Control String.
- Setting of the graphics active position and left margin.
- Advancing the graphics active position to the next horizontal grid position.
- The String Terminator (ST) control character causes the printer to exit Sixel Graphics mode and return to text mode.

A Graphics Carriage Return (DECGCR) command or a Graphics New Line (DECGNL) command moves the graphics active position to the graphics left margin. The Graphics New Line command also moves the graphics active position down to the next graphics line (six vertical grid positions below the current active position.)

Horizontal and vertical directions follow the text orientation. The printer images sixels from left to right, top to bottom.

Sixel Graphics Commands

DECGCR ($) **Graphics Carriage Return:** Moves the graphics active horizontal position to the graphics left margin.

Format

$

DECGNL (-) **Graphics Next Line:** Moves the graphics active position to the graphics left margin and down one line of sixels (six actual grid units).

Format

–

Description

This command is affected by page coordinate bounds.

DECGRA (")

Set Raster Attributes: Defines the pixel aspect ratio, overriding Ps1 of the protocol selector. DECGRA also defines the extent (size) of the raster. Level 3 printers ignore the extent parameters.

Format

" Pn1 ; Pn2 ; Pn3 ; Pn4

Description

This command must precede picture-definition information requiring an aspect ratio: sixel printable characters (sixel data, 3/15-7/14), the Graphics New Line (DECGNL) command and, by extension, Graphics Repeat Introducer (DECGRI) and Graphics Carriage Return (DECGCR). Otherwise, this command is ignored. If multiple DECGRA sequences are received, only the last one is accepted.

Parameter	Description
Pn1	Pixel aspect ratio numerator
Pn2	Pixel aspect ration denominator
Pn3	Horizontal extent
Pn4	Vertical extent

Pn1 describes the vertical size of a pixel in an arbitrary distance unit. Pn2 describes the horizontal size of a pixel in the same distance unit. For example, to define a pixel to be half as wide as it is tall, send 200; 100 for Pn1 and Pn2.

The pixel aspect ratio times the horizontal grid size (Ps3 of the protocol selector) yields the vertical grid size.

Pn3 and Pn4 define the horizontal and vertical extent, respectively, in pixels. Level 3 printers ignore these parameters. Page composition software can include these parameters for compatibility with video terminals.

Error Handling

If Pn1 or Pn2 is greater than 32K, the value 32K is used. If Pn1 or Pn2 is 0 or omitted, the printer sets it to 1.

The maximum aspect ratio supported by the printer is 1: 10 or 10: 1 (after reducing the ratio to the lowest possible format).

The maximum parameter implemented for DECGRA is 999 (decimal).

If the Set Raster Attributes sequence is received after a sixel printable character or another sixel control code is received, the command is ignored.

Any additional parameters received are ignored.

DECGRI (!)

Graphics Repeat Introducer: Repeats the following sixel a specified number of times.

Format

! Pn

Description

The printer repeats the sixel following the DECGRI sequence Pn times.

The repeat function supports parameters large enough to cover the largest print line at the smallest grid size, up to 32K.

The following examples illustrate repeat sequences:

! 1 0 ?	Repeats 10 graphics spaces
! 6 @	Repeats 6 patterns of top dot

Error Handling

A repeat count of zero or omitted is treated as a repeat count of one. Values that exceed the maximum value are treated as the maximum value. If no sixel printable character follows the repeat count, the repeat count is ignored.

If a graphics control code is received within a DECGRI sequence, the repeat sequence is ignored. This includes sequences in the range 21 to 2F, 3A, and 3C to 3E. If multiple parameters are received (separated by semicolons), the printer uses the first parameter and ignores the rest.

		5000 Series		PPLIII	
Ps1	Aspect Ratio	Appr. Horz. Grid Size	True Vert. Grid Size	Appr. Horz. Grid Size	True Vert. Grid Size
0	200:100	50	100	144	72
1	200:100	50	100	144	72
2	450:100	22	100	324	72
3	300:100	33	100	216	72
4	250:100	40	100	180	72
5	183:100	54	100	132	72
6	150:100	66	100	108	72
7	130:100	77	100	94	72
8	112:100	89	100	81	72
9	100:100	100	100	72	72
>9	200:100	50	100	144	72

APPENDIX A. USING THE HEX DUMP

A printout of hexadecimal data is useful primarily to application programmers or service representatives as a debugging or troubleshooting tool.

With the printer **Offline**, enable the hex dump mode of printing by pressing:

- ◄ or ► (left or right) menu browse pushbutton until **Set Up** is displayed in the lower right corner of the LCD
- ▼ (down) menu browse pushbutton
- ◄ or ► (left or right) menu browse pushbutton until **Select Filter** is displayed in the lower right corner of the LCD
- ▼ (down) menu browse pushbutton
- ◄ or ► (left or right) menu browse pushbutton until appropriate (**Serial**, **Parallel (1284)**, or **Expansion 1** or **Expansion 2**) port is displayed in the lower right corner of the LCD
- ▼ (down) menu browse pushbutton
- ◄ or ► (left or right) menu browse pushbutton until **Hex Dump** is displayed in the lower right corner of the LCD
- **Select** pushbutton

Hex dump causes data received from the host to be printed out in ASCII form. A sample is shown below.

```
30 31 32 33 34 35 36 37 38 39 41 42 43 44 45 46       0123456789ABCDEF
OD 0A 54 48 45 20 54 57 4F 20 44 4F 54 53 20 59       ..THE TWO DOTS Y
4F 55 20 4A 55 53 54 20 53 41 57 20 57 45 52 45       OU JUST SAW WERE
20 41 20 52 45 53 55 4C 54 20 4F 46 20 41 20 43        A RESULT OF A C
41 52 52 49 41 47 20 52 45 54 55 52 4E 20 41 4E       ARRIAG RETURN AN
44 20 4C 49 4E 45 20 45 45 45 44 2E 0D 0A 41 4C       D LINE FEED...AL
4C 20 43 4F 4E 54 52 4F 4C 20 43 48 41 52 41 43       L CONTROL CHARAC
54 45 52 53 20 41 52 45 20 52 45 50 52 45 53 45       TERS ARE REPRESE
4E 54 45 44 20 42 59 20 44 4F 54 53 20 54 48 49       NTED BY DOTS THI
53 20 44 4F 54 20 1B 20 49 53 20 41 4E 20 45 53       S DOT . IS AN ES
43 41 50 45 20 43 4F 44 45 2E 0D 0A 41 20 44 4F       CAPE CODE...A DO
54 20 54 4F 20 54 48 45 20 52 49 47 48 54 20 4F       T TO THE RIGHT O
46 20 41 20 48 45 58 20 43 4F 44 45 20 4D 45 41       F A HEX CODE MEA
4E 53 20 54 48 41 54 20 54 48 45 20 50 49 20 4C       NS THAT THE PI L
45 41 44 20 57 41 53 20 53 45 54 20 41 54 20 54       EAD WAS SET AT T
48 41 54 20 54 49 4D 45 2E 0D 0A 53 45 45 20 54       HAT TIME...SEE T
48 45 20 44 4F 54 53 20.20.20.20.49 4E 20 54 48       HE DOTS    IN TH
```

The hexadecimal printout is shown on the left side and the equivalent plain text is shown on the same line at the right. Exceptions: ASCII control code characters below hexadecimal 20 are printed out as periods on the right side. An SP or hexadecimal 20 causes a blank apace in the equivalent print position.

By examining the printout, you can see what data was actually sent to the printer.

APPENDIX B. FONT PRINT SAMPLES

The following samples were printed at 10 characters per inch (CPI) at 6 lines per inch (LPI).

HIGH SPEED FONT

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

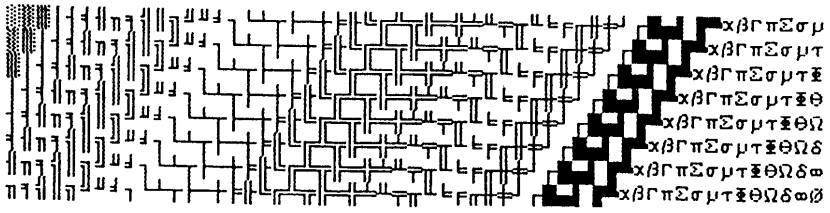
GOTHIC DRAFT – DATA PROCESSING FONT

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

GOTHIC NEAR LETTER QUALITY

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

CHARACTER GRAPHICS FONT



CORRESPONDENCE FONT

(BETTER QUALITY THAN DRAFT-BETTER SPEED THAN NLQ)

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

OCR-A FONT

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

OCR-B FONT

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

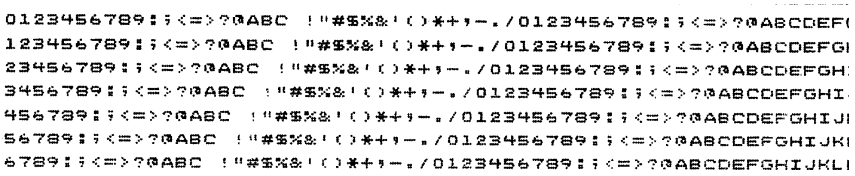
COURIER NLQ FONT

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

ITALIC NLQ FONT

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefgh
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghij
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
```

HIGH SPEED 2


0123456789:;<=>?@ABC !"#$%&'()*+,-./0123456789:;<=>?@ABCDEF
123456789:;<=>?@ABC !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFG
23456789:;<=>?@ABC !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGH
3456789:;<=>?@ABC !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
456789:;<=>?@ABC !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJ
56789:;<=>?@ABC !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJK
6789:;<=>?@ABC !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL

APPENDIX C. POSTNET BAR CODES

ENTERING AND EXITING POSTNET BAR CODES

Selecting POSTNET Style Bar Codes

The following sequence selects the style of bar code to be printed. In this case POSTNET is chosen:

Mnemonic: ESC [50;p2;p3;p4;p5;p6;p7;p8;p9;p10}

BASIC: LPRINT CHR$(27);"[50;9;1;2;6;2;6;2;0;0}"

or simply:

ESC [50}
LPRINT CHR$(27);"[50}"

Parameters p2 - p10 do not affect POSTNET but if they are sent. they will be stored and used if another bar code style is selected. POSTNET symbols can neither be rotated nor have their size or density modified.

Before the printer can print input data as POSTNET bar code symbols, the bar code mode must be both selected and activated. There are two ways for this to be accomplished depending on the setting of ANSI emulation option 1.

ANSI emulation option 1 is used to enable the SI (shift In) and SO (shift out) ASCII codes to activate and deactivate special mode functions. In this case, the special mode function is bar codes. With ANSI emulation option 1 in (active), code SO will turn on or activate the bar code mode. SI will turn bar codes off.

Enter the POSTNET bar code mode of printing with the following control sequence sent by the host:

Mnemonic: ESC [3 t

BASIC: LPRINT CHR$(27);"[3t";";

Data sent after the above sequence is interpreted and printed as POSTNET bar code symbols.

Exit POSTNET bar code mode using:

Mnemonic: ESC [O t

BASIC: LPRINT CHR$(27);"[0t;

Mnemonic: ESC [3 t

BASIC: LPRINT CHR$(27);"[3t";

Selects the bar code special mode.

Mnemonic: SO

BASIC: LPRINT CHR$(14);

Activates POSTNET bar codes and prints received data as POSTNET symbols (only after it has been selected by ESC[3t above).

Mnemonic: <SI>

BASIC: LPRINT CHR$(15);

Deactivates bar codes and allows printing of normal text. (POSTNET is still selected but not active.)

Mnemonic: <ESC> [0t

BASIC: LPRINT CHR$(27);"[0t; Deselects bar codes.

When an ESC[0t is received before the Al code, bar codes are both deactivated and deselected.

Valid Characters

Only certain characters are valid as data within the POSTNET bar code escape sequence. Any other character causes the error symbol (XOX) to be printed instead. Valid characters are the numerals 0-9. The dash (-) will be ignored if it is found in character position six or greater to allow processing of ZIP+4 data (22980-1999).

Characters acting as delimiters (space, comma, and horizontal tab) are allowed to separate and add space between consecutive POSTNET symbols.

Delimiters (Spacing between codes)

Delimiters are used to separate and add space between POSTNET codes without exiting bar code printing.

A **comma** will add no additional space between symbols. The distance between two symbols will be the quiet zone (0. 4 inch).

A **space** character will add 0. 1 inch of space between symbols. One space character and the quiet zone will equal a total of 0. 5 inch.

A **horizontal tab** will add the appropriate number of empty spaces to go to the next tab before starting the symbol. Horizontal tabs in POSTNET are based on 10 columns. or text characters, per inch (10 CPI).

Incorrect Number of Digits

If less than five digits for a ZIP Code or nine for a ZIP+4 are received, the symbol will be printed with the missing digits replaced by error symbols.

If more than six digits (ZIP and correction digit) are received, the data will be treated as a Z1P+4 or ZIP+6 code. If less digits than a ZIP+4 or ZIP+6 are received, error symbols will be printed to fill the symbol. Note: The U. S. Postal Service may implement ZIP+6 at a later date.

When more digits are received than are required for a valid symbol, the symbol will be terminated, printed, and a new symbol started.

Restrictions

Printer option strap 13 in General Printer Options, paper position reset to top of bar code after printing, is ignored while using POSTNET. (See Appendix D, General Printer Options, Group 2).

If the symbol exceeds the right margin, the symbol is cut off at the margin.

POSTNET codes cannot be used on the same line as the high speed font.

Exit the bar code mode before sending other control codes or escape sequences.

APPENDIX D. DESCRIPTION OF STRAPPING OPTIONS

This appendix contains descriptions for firmware strap settings, which are changed using the Set Up menu.

GENERAL PRINTER OPTIONS DEFINITIONS

I/F Hardware Straps

H Bits 01-32	Function	If Enabled	If Disabled
01	Prime	High = Buffer Clear.	Low = Buffer Clear.
02	Interrupt	On all Control Codes.	Disabled on all Control Codes, except LF, VT, FF, CR, DC1 and DC3.
03	DEL	Does not cause an Interrupt.	Causes an Interrupt.
04	DEL	Does not cause Prime.	Causes Prime.
05-06	Reserved.		
07	Underline character	Treated as CR.	Printed.
08	PI Lead	Causes Interrupt.	Does not cause Interrupt.
09	ACK lead	Does not reflect ONLINE/LOCAL status. 05 must be enabled.	Reflects ONLINE/LOCAL status.
10	Character conversion to space.	Enabled. (See 41-48.)	Disabled.
11	CR	Not decoded.	Generate an Interrupt.
12	FF	Not decoded.	Generate an Interrupt.
13	LF	Not decoded.	Generate an Interrupt.
14	VT	Not decoded.	Generate an Interrupt.
15	DC3	Not decoded.	Generate an Interrupt.
16	DC1	Not decoded.	Generate an Interrupt.
17	Busy	Does not reflect ACK.	Reflects ACK.
18	Busy/Demand per character.	Enabled.	Disabled.
19	Software control of Busy.	Disabled	Enabled.
20	Busy	Does not reflect (ONLINE/LOCAL) FAULT/PO status.	Reflects (ONLINE/LOCAL) FAULT/PO status.
21	Busy	Does not reflect (FAULT) ONLINE/LOCAL status.	Reflects (FAULT) ONLINE/LOCAL status.
22	Busy	Does not reflect (PO) ONLINE/LOCAL/PO status.	Reflects (PO) ONLINE/LOCAL/PO status.
23	ACK	Does not reflect PO.	Reflects PO.
24	ACK	Does not reflect FAULT.	Reflects FAULT.
25	Data leads	0-7 are active high.	0-7 are active low.
26	Busy is active	High.	Low.
27	PI is active	High.	Low.
28	PI	Enabled.	Disabled.
29	STB is active	High.	Low.
30	SELECT is active	High.	Low.
31	PO is active	High.	Low.
32	FAULT is active	High.	Low.

H Bits 33-64	Function	If Enabled.	If Disabled		
33	Demand delay.	Disabled.	Enabled.		
34-35	Set ACK delay from Strobe.		**34**	**35**	**Delay**
			Disable	Disable	None
			Disable	Enable	1 µsec
			Enable	Disable	2 µsec
			Enable	Enable	3 µsec
36-37	Set ACK Pulse Width.		**36**	**37**	**Width**
			Disable	Disable	None
			Disable	Enable	1 µsec
			Enable	Disable	2 µsec
			Enable	Enable	3 µsec
38-40	Reserved.				
41-48	Used with strap 10 to select space character substitution. 41 corresponds with Bit 1 of the character code.				
49-64	Reserved.				

LEGACY PARALLEL SOFTWARE STRAP DEFINITIONS

I/F Software Straps

Bits 01-32	Function	If Enabled	If Disabled
01-03	Reserved for future use.		
04	Prime on Select.	Disabled.	Enabled.
05	No Fault on PO or Deselect.	Disabled.	Enabled.
06-07	Reserved for future use.		
08	8 bit Data.	Enabled.	Bit 8 equals 0.
09-32	Reserved for future use.		
Bits 33-64	**Function**	**If Enabled**	**If Disabled**
33-39	Reserved for future use.		
40	Parallel timeout.	Disabled.	Enabled.
41-64	Reserved for future use.		

EMULATION OPTION DESCRIPTIONS

ANSI (4800)

Options	Meaning if Active	If Active	If Inactive
01	Oversize and Bar code	Select via SI/SO.	No selection via SI/SO
02	RCC mode	Reset RCC mode.	Set RCC mode.
03	ESC C control	Disable ESC C sequence.	Reset when ESC C is received.
04	Reserved.		
05	Reserved.		
06	GENCIC control	Set (80-8F as control).	Reset (80-9F per GENCS2).
07	GENCS2 control	Set (80-9F, 15, print).	Reset (80-9F ignore)
08	Line grid control	LF = next LPI grid	LF = LF
09	Dbl strike/shadow control	Double Strike	Shadow.
10	Character Graphics/Postnet	Char Graphics in SCR[2] esc[12m.	Canad. Postnet in SGR[2] esc[12m.
11-32	Reserved.		

ANSI (4410)

<table>
<tr><th>Options</th><th>Function</th><th colspan="6">If Active</th><th>If Inactive</th></tr>
<tr><td>01</td><td>SI/SO selects Oversize and Bar code</td><td colspan="6">Select..</td><td>Ignore SI/SO.</td></tr>
<tr><td>02</td><td colspan="8">Reserved.</td></tr>
<tr><td>03</td><td>ESC C control</td><td colspan="6">Disable ESC C sequence.</td><td>Reset when ESC C is received.</td></tr>
<tr><td>04</td><td colspan="8">Reserved.</td></tr>
<tr><td>05</td><td colspan="8">Reserved.</td></tr>
<tr><td>06</td><td>GENCIC control</td><td colspan="6">Set (80-8F as control).</td><td>Reset (80-9F per GENCS2).</td></tr>
<tr><td>07</td><td>GENCS2 control</td><td colspan="6">Set (80-9F, 15, print).</td><td>Reset (80-9F ignore).</td></tr>
<tr><td>08</td><td>Line grid control</td><td colspan="6">LF = next LPI grid.</td><td>LF = LF.</td></tr>
<tr><td>09</td><td>Dbl strike/shadow control</td><td colspan="6">Double Strike</td><td>Shadow.</td></tr>
<tr><td>10</td><td>Character Graphics/Postnet</td><td colspan="6">Char Graphics in SCR[2] esc[12m.</td><td>Canadian. Postnet in SGR[2] esc[12m.</td></tr>
<tr><td>11</td><td>Bit 8 control</td><td colspan="6">8th bit is alternative font..</td><td>8th bit selects 256 character offset.</td></tr>
<tr><td>12</td><td colspan="8">Reserved.</td></tr>
<tr><td rowspan="11">13-16</td><td rowspan="11">Alternate Font Selection Defaults</td><td>13</td><td>14</td><td>15</td><td>16</td><td>SGR</td><td colspan="2">Font Name</td></tr>
<tr><td>Disable</td><td>Disable</td><td>Disable</td><td>Disable</td><td>10</td><td colspan="2">Gothic Draft</td></tr>
<tr><td>Enable</td><td>Disable</td><td>Disable</td><td>Disable</td><td>11</td><td colspan="2">Gothic Draft</td></tr>
<tr><td>Disable</td><td>Enable</td><td>Disable</td><td>Disable</td><td>12</td><td colspan="2">Char Graphics</td></tr>
<tr><td>Enable</td><td>Enable</td><td>Disable</td><td>Disable</td><td>13</td><td colspan="2">Gothic NLQ</td></tr>
<tr><td>Disable</td><td>Disable</td><td>Enable</td><td>Disable</td><td>14</td><td colspan="2">Courier NLQ</td></tr>
<tr><td>Enable</td><td>Disable</td><td>Enable</td><td>Disable</td><td>15</td><td colspan="2">High Speed</td></tr>
<tr><td>Disable</td><td>Enable</td><td>Enable</td><td>Disable</td><td>16</td><td colspan="2">OCR-A NLQ</td></tr>
<tr><td>Enable</td><td>Enable</td><td>Enable</td><td>Disable</td><td>17</td><td colspan="2">OCR-B NLQ</td></tr>
<tr><td>Disable</td><td>Disable</td><td>Disable</td><td>Enable</td><td>18</td><td colspan="2">Italics NLQ</td></tr>
<tr><td>Enable</td><td>Disable</td><td>Disable</td><td>Enable</td><td>19</td><td colspan="2">Correspondence</td></tr>
<tr><td>17-32</td><td colspan="8">Reserved</td></tr>
</table>

Proprinter III XL

Options	Function	If Active	If Inactive
01	RESERVED (Slashed Zero)	Copy of ENG_OP_SLASH_ZERO from GenPtrOpts Strap 3).	
02	Line Length	8 inches.	13.6 inches.
03	Condensed Print	12 cpi.	20 cpi.
04	Initial Code page	Multinational.	USA.
05	Character Set Select default	Character set 2.	Character set 1.
06	Default Form Length	12” Form.	11” Form.
07	Reserved	Copy of AUTOLF_ON_CR from Print Control Menu..	
08	Reserved	Copy of AUTOCR_ON_VM from Print Control Menu.	
09	NLQ II	Can use mulitnational.	No multinational.
10	Reserved	Copy of AUTOCR_ON_LF from Print Control Menu..	
11	Reserved	Copy of AUTOCR_ON_FF from Print Control Menu.	
12	Ignore Esc I	Ignore Esc I command	Process Esc I command
13	Simulate 136	Simulate 136 columns.	Standard 132 columns.
14-32	Reserved		

EPSON FX286e

Options	Function	If Active	If Inactive
01	Condensed Print.	Enabled	Disabled.
02	Italics font control	Codes 128-255 are Code Page.	Codes 128-255 are Italics.
03	Default Print Quality	Default print quality is NLQ.	Default print quality is draft.
04	Default Perf Skip	1 inch perf skip default.	No perf skip default.
05	Ignore Esc I	Ignore Esc I command	Process Esc I command
06	136 Col.	Simulate 136 Columns	Standard 132 Columns.
07-32	Reserved		

Printronix Pseries

Options	Function	If Active	If Inactive
01	Overstrike	Enabled.	Disabled.
02	ACK selects LPI for 1 line	10.3 LPI.	8 LPI.
03	VFU load	PI required for VFU load.	No PI required for VFU load.
04	Defines codes 80 to 9F	80 to 9F hex are printable.	80 to 9F hex are control codes.
05	Backspace	= Backspace.	= Double High.
06-32	Reserved.		

Printronix P300/600

Options	Function	If Active	If Inactive
01	Edit Line (Carriage Return)	= Carriage Return.	Edit mode.
02	Restrict LPI	To 8.	Non-restricted LPI.
03-12	Reserved.		
13-16	Alternate Font Selection Defaults		

13	14	15	16	SGR	Font Name
Disable	Disable	Disable	Disable	10	Gothic Draft
Enable	Disable	Disable	Disable	11	Gothic Draft
Disable	Enable	Disable	Disable	12	Char Graphics
Enable	Enable	Disable	Disable	13	Gothic NLQ
Disable	Disable	Enable	Disable	14	Courier NLQ
Enable	Disable	Enable	Disable	15	High Speed
Disable	Enable	Enable	Disable	16	OCR-A NLQ
Enable	Enable	Enable	Disable	17	OCR-B NLQ
Disable	Disable	Disable	Enable	18	Italics NLQ
Enable	Disable	Disable	Enable	19	Correspondence

17-32	Reserved		

Dec LG Plus

Options	Function	If Active	If Inactive
01	Unsolicited Reporting	Enabled (See strap S-2).	Disabled (default).
02	Unsolicited status report size	Extended unsolicited reports.	Brief unsolicited reports. (default).
03	User Preference	= Latin 9 (Euro Ready)	= DEC Supplemental (default).
04-32	Reserved.		

Dec PPL3

Options	Function	If Active	If Inactive
01	ISO Latin9	Enabled.	Disabled.
02-32	Reserved.		

APPENDIX E. DSC CODE CHARTS

ENGLISH U.S. (CP 037B)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	^	{	}	\	0
1	-	-	-	-		é	/	É	a	j	~	£	A	J	÷	1
2	-	-	-	-	ä	ê	Â	Ê	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	®	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	β	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	¢	!	¦	:	«	ª	¡	[	-	¹	²	³
B	-	-	-	-	.	$	,	#	»	º	¿	]	ô	û	ô	Ô
C	-	-	-	-	<	*	%	@	ð	æ	Ð	¯	ö	ü	ö	Ü
D	-	-	-	-	(	)	_	'	ý	¸	ý	¨	ò	ù	ò	Ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	Ú
F	-	-	-	-	¦	¬	?	"	±	¤	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

¦	0	1	2	3	4	5	6	7	8	9	A	B
0¦			0	&	à	-	Â	-	a	q	A	Q
1¦	EM	=	1	-	è	ë	È	Ë	b	r	B	R
2¦	FF	'	2	.	-	ï	-	Ï	c	s	C	S
3¦	NL	"	3	,	-	-	-	-	d	t	D	T
4¦	STP	/	4	:	ù	ü	Ù	Ü	e	u	E	U
5¦	CR	\	5	+	-	â	-	Â	f	v	F	V
6¦		¦	6	¬	-	ê	-	Ê	g	w	G	W
7¦		¦	7	-	-	î	-	Î	h	x	H	X
8¦	>	?	8	-	-	ô	-	Ô	i	y	I	Y
9¦	<	!	9	-	-	û	-	Û	j	z	J	Z
A¦	-	$	-	^	-	-	-	-	k	-	K	-
B¦	-	¢	-	~	-	é	-	É	l	-	L	-
C¦	)	-	#	¨	-	-	-	-	m	-	M	-
D¦	(	-	@	`	-	-	-	-	n	ç	N	Ç
E¦	}	-	%	´	-	-	-	-	o	;	O	;
F¦	{	-	_	¸	-	-	-	-	p	*	P	*

ENGLISH U.S. (CP 037)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	^	{	}	\	0
1	-	-	-	-		é	/	É	a	j	~	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	Ê	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	@	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	¢	!	¦	:	«	ª	¡	[	-	¹	²	³
B	-	-	-	-	.	$	,	#	»	º	¿	]	õ	û	ô	Ô
C	-	-	-	-	<	*	%	@	ð	æ	Ð	¯	ö	ü	ö	Ü
D	-	-	-	-	(	)	_	'	ý	ª	Ý	¨	ò	ù	ò	Ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	Ú
F	-	-	-	-	¦	¬	?	"	±	¤	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

¦	0	1	2	3	4	5	6	7	8	9	A	B
0¦			0	&	-	"	-	#	a	q	A	Q
1¦	EM	=	1	-	-	-	-	-	b	r	B	R
2¦	FF	'	2	.	-	-	-	-	c	s	C	S
3¦	NL	"	3	,	-	¢	-	@	d	t	D	T
4¦	STP	/	4	:	-	!	-	$	e	u	E	U
5¦	CR	\	5	+	-	-	-	-	f	v	F	V
6¦		¦	6	¬	-	-	-	-	g	w	G	W
7¦		¦	7	-	-	-	-	-	h	x	H	X
8¦	>	?	8	-	-	-	-	-	i	y	I	Y
9¦	<	!	9	-	-	-	-	-	j	z	J	Z
A¦	¢	$	¦	-	-	-	-	-	k	"	K	#
B¦	!	¢	-	~	-	-	-	-	l	¢	L	@
C¦	)	-	#	~	-	-	-	-	m	!	M	$
D¦	(	-	@	`	-	-	-	-	n	-	N	-
E¦	}	$	%	-	-	-	-	-	o	;	O	;
F¦	{	-	_	-	-	¦	-	#	p	*	P	*

U.S. ASCII (CP 038)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	-	-	-	-	-	{	}	\	0
1	-	-	-	-	-	-	/	-	a	j	~	-	A	J	-	1
2	-	-	-	-	-	-	-	-	b	k	s	-	B	K	S	2
3	-	-	-	-	-	-	-	-	c	l	t	-	C	L	T	3
4	-	-	-	-	-	-	-	-	d	m	u	-	D	M	U	4
5	-	-	-	-	-	-	-	-	e	n	v	-	E	N	V	5
6	-	-	-	-	-	-	-	-	f	o	w	-	F	O	W	6
7	-	-	-	-	-	-	-	-	g	p	x	-	G	P	X	7
8	-	-	-	-	-	-	-	-	h	q	y	-	H	Q	Y	8
9	-	-	-	-	-	-	-	`	i	r	z	-	I	R	Z	9
A	-	-	-	-	[	]	{	:	-	-	-	-	-	-	-	-
B	-	-	-	-	.	$	,	#	-	-	-	-	-	-	-	-
C	-	-	-	-	<	*	%	@	-	-	-	-	-	-	-	-
D	-	-	-	-	(	)	_	'	-	-	-	-	-	-	-	-
E	-	-	-	-	+	;	>	=	-	-	-	-	-	-	-	-
F	-	-	-	-	!	^	?	"	-	-	-	-	-	-	-	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	{	-	[	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	!	-	\	d	t	D	T
4-	STP	/	4	:	-	}	-	]	e	u	E	U
5-	CR	\	5	+	{	-	#	-	f	v	F	V
6-		-	6	-	!	-	@	-	g	w	G	W
7-		!	7	-	-	-	-	-	h	x	H	X
8-	>	?	8	[	{	-	A	-	i	y	I	Y
9-	<	!	9	-	}	-	E	-	j	z	J	Z
A-	[	$	~	^	]	-	E	-	k	-	K	-
B-	]	-	@	~	~	-	I	-	l	-	L	-
C-	)	#	#	-	!	-	O	-	m	-	M	-
D-	(	-	@	`	`	-	U	-	n	~	N	\
E-	}	-	%	}	-	-	-	-	o	;	O	;
F-	{	-	_	-	\	-	C	-	p	*	P	*

INTERNATIONAL SET 1 (CP 256)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	¢	{	}	\	0
1	-	-	-	-		é	/	É	a	j	~	£	A	J		1
2	-	-	-	-	â	ê	Â	Ê	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	Ŕ	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	ƒ	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	[	]	¦	:	«	ª	¡	¬	-	¹	²	³
B	-	-	-	-	.	$	,	#	»	º	¿	¦	ð	û	ô	0
C	-	-	-	-	<	*	%	@	ð	æ	Ð	¯	ö	ü	ö	Ü
D	-	-	-	-	(	)	_	'	ý	¸	Ý	¨	ò	ù	ò	ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	ú
F	-	-	-	-	!	^	?	"	±	¤	®		õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	{	-	[	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	¨	-	-	c	s	C	S
3-	NL	"	3	,	-	¦	-	\	d	t	D	T
4-	STP	/	4	:	-	}	-	]	e	u	E	U
5-	CR	\	5	+	{	â	#	-	f	v	F	V
6-		-	6	^	¦	-	@	-	g	w	G	W
7-		¦	7	-	-	-	-	ê	h	x	H	X
8-	>	?	8	[	{	-	A	-	i	y	I	Y
9-	<	!	9	-	}	-	E	-	j	z	J	Z
A-	[	$	~	^	]	á	E	-	k	-	K	-
B-	]	-	@	~	~	-	I	-	l	-	L	-
C-	)	#	#	-	¦	-	O	-	m	-	M	-
D-	(	-	@	`	`	-	U	-	n	~	N	\
E-	}	-	%	}	-	-	-	-	o	;	O	;
F-	{	-	_	-	\	-	C	-	p	*	P	*

CANADIAN FRENCH (CP 260)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	-	-	-	-	-	é	è	-	0
1	-	-	-	-	-	-	/	É	a	j	¨	-	A	J	-	1
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3	-	-	-	-	-	ë	-	Ë	c	l	t	-	C	L	T	3
4	-	-	-	-	-	-	À	È	d	m	u	-	D	M	U	4
5	-	-	-	-	-	-	-	-	e	n	v	-	E	N	V	5
6	-	-	-	-	-	î	-	Î	f	o	w	-	F	O	W	6
7	-	-	-	-	-	ï	-	Ï	g	p	x	-	G	P	X	7
8	-	-	-	-	ç	-	Ç	-	h	q	y	-	H	Q	Y	8
9	-	-	-	-	-	-	-	`	i	r	z	-	I	R	Z	9
A	-	-	-	-	à	´	ù	:	-	-	-	-	-	-	-	-
B	-	-	-	-	.	$	,	#	-	-	-	-	ô	û	ö	0
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D	-	-	-	-	(	)	_	'	-	-	-	-	-	-	-	Ù
E	-	-	-	-	+	;	>	=	-	-	-	-	-	-	-	-
F	-	-	-	-	!	^	?	"	-	-	-	-	-	-	-	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	à	-	À	-	a	q	A	Q
1-	EM	=	1	-	è	ë	È	Ë	b	r	B	R
2-	FF	'	2	.	-	ï	-	Ï	c	s	C	S
3-	NL	"	3	,	-	-	-	-	d	t	D	T
4-	STP	/	4	:	ù	ü	Ù	Ü	e	u	E	U
5-	CR	-	5	+	-	â	-	Â	f	v	F	V
6-		-	6	-	-	ê	-	Ê	g	w	G	W
7-		-	7	-	-	î	-	Î	h	x	H	X
8-	>	?	8	-	-	ô	-	Ô	i	y	I	Y
9-	<	!	9	-	-	û	-	Û	j	z	J	Z
A-	-	$	-	^	-	-	-	-	k	-	K	-
B-	-	-	-	-	-	é	-	É	l	-	L	-
C-	)	-	#	¨	-	-	-	-	m	-	M	-
D-	(	-	@	`	-	-	-	-	n	ç	N	Ç
E-	-	-	%	´	-	-	-	-	o	;	O	;
F-	-	-	_	¬	-	-	-	-	p	*	P	*

AUSTRIAN/GERMAN (CP 273)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	¢	ä	ü	ö	0
1	-	-	-	-		é	/	É	a	j	ß	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	¢	b	k	s	¥	B	K	S	2
3	-	-	-	-	í	ë	Í	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	©	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	@	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	~	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	Ä	Ü	ö	:	«	ª	¡	¬	-	¹	²	³
B	-	-	-	-	.	$	,	#	»	º	¿	¦	ô	û	ô	Û
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F	-	-	-	-	!	^	?	"	±	¤	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	ä	-	Ä	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	ö	-	Ö	d	t	D	T
4-	STP	/	4	:	-	ü	-	Ü	e	u	E	U
5-	CR	ö	5	+	ä	â	#	-	f	v	F	V
6-		-	6	-	ö	-	§	¢	g	w	G	W
7-		ö	7	-	-	-	-	-	h	x	H	X
8-	>	?	8	Ä	ä	-	A	-	i	y	I	Y
9-	<	!	9	-	ü	-	E	-	j	z	J	Z
A-	Ä	$	ß	^	Ü	á	E	-	k	-	K	-
B-	Ü	-	§	ß	ß	-	I	-	l	-	L	-
C-	)	#	#	-	ö	-	O	-	m	-	M	-
D-	(	-	§	`	`	-	U	-	n	ß	N	ö
E-	ü	-	%	ü	-	-	-	-	o	;	O	;
F-	ä	-	_	-	ö	-	C	-	p	*	P	*

BELGIAN (CP 274)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	¢	é	è	ç	0
1	-	-	-	-		{	/	£	a	j	¨	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	£	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	@	}	À	È	d	m	u	©	D	M	U	4
5	-	-	-	-	á	í	Á	ł	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	Ł	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	\	ì	Ç	ł	h	q	y	½	H	Q	Y	8
9	-	-	-	-	Ñ	ß	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	[	]	ù	:	«	ª	¡	¬	-	¹	²	³
B	-	-	-	-	.	$	,	#	»	º	¿	¦	ô	û	ð	Ô
C	-	-	-	-	<	*	%	à	ð	æ	Ð	—	ö	ü	ö	Ü
D	-	-	-	-	(	)	_	'	ý	~	Ý	~	ò	¦	ò	Ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	Ú
F	-	-	-	-	!	^	?	"	±	¤	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	-	-	-	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	-	-	-	d	t	D	T
4-	STP	/	4	:	-	-	-	-	e	u	E	U
5-	CR	-	5	+	-	-	-	-	f	v	F	V
6-		-	6	-	-	-	-	-	g	w	G	W
7-		-	7	-	-	-	-	-	h	x	H	X
8-	>	?	8	[	à	-	A	-	i	y	I	Y
9-	<	!	9	-	è	-	E	-	j	z	J	Z
A-	[	$	-	^	é	-	E	-	k	-	K	-
B-	]	-	]	-	-	-	-	-	l	-	L	-
C-	)	#	#	¨	-	-	-	-	m	-	M	-
D-	(	-	-	`	ù	-	U	-	n	-	N	-
E-	-	-	%	-	-	-	-	-	o	;	O	;
F-	-	-	_	-	ç	-	U	-	p	*	P	*

BRAZILIAN (CP 275)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	-	-	-	-		}	/	[	a	j	~	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	£	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	®	D	M	U	4
5	-	-	-	-	á	í	Á	f	e	n	v	§	E	N	V	5
6	-	-	-	-	`	î	@	f	f	o	w	¶	F	O	W	6
7	-	-	-	-	ã	ï	Ã	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	]	ì	]	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	ã	i	r	z	¾	I	R	Z	9
A	-	-	-	-	£	$	ç	:	«	ª	¡	¬	-	¹	²	³
B	-	-	-	-	.	Ç	,	õ	»	º	¿	¦	ô	û	ó	ù
C	-	-	-	-	<	*	%	Ã	ð	æ	Ð	¯	ö	ü	ò	ú
D	-	-	-	-	(	)	_	'	ý	ª	Ý	¨	ò	ù	ò	ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	ú
F	-	-	-	-	!	^	?	"	±	¤	®	×	{	ÿ	#	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	-	-	-	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	-	-	-	d	t	D	T
4-	STP	/	4	:	-	-	-	-	e	u	E	U
5-	CR	\	5	+	ã	-	Ã	-	f	v	F	V
6-		-	6	-	õ	-	Õ	-	g	w	G	W
7-		-	7	-	-	-	-	-	h	x	H	X
8-	>	?	8	-	-	-	-	-	i	y	I	Y
9-	<	!	9	-	-	-	-	-	j	z	J	Z
A-	-	$	-	^	-	-	-	-	k	-	K	-
B-	-	-	-	~	-	é	-	É	l	-	L	-
C-	)	-	-	-	-	-	-	-	m	-	M	-
D-	(	-	-	-	-	-	-	-	n	ç	N	Ç
E-	-	-	%	-	-	-	-	-	o	;	O	;
F-	-	-	_	-	-	-	-	-	p	*	P	*

DANISH/NORWEGIAN (CP 277)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	-	-	-	-		é	/	£	a	j	ü	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	Ê	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	©	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	}	ï	$	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	#	¤	ø	:	«	ª	¡	¬	-	¹	²	³
B	-	-	-	-	.	Â	,	Æ	»	º	¿	¦	ô	û	ô	Û
C	-	-	-	-	<	*	%	Ø	ð	{	Ð	—	ö	~	ö	Ü
D	-	-	-	-	(	)	_	'	ý	~	¥	¨	ò	ù	ò	Ù
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F	-	-	-	-	!	^	?	"	±	]	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	æ	-	Æ	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	ø	-	Ø	d	t	D	T
4-	STP	/	4	:	-	-	-	-	e	u	E	U
5-	CR	\	5	+	-	-	-	-	f	v	F	V
6-		-	6	-	-	-	-	-	g	w	G	W
7-		-	7	-	-	-	-	-	h	x	H	X
8-	>	?	8	-	-	-	-	-	i	y	I	Y
9-	<	!	9	-	-	-	-	-	j	z	J	Z
A-	-	-	-	^	-	-	-	-	k	æ	K	Æ
B-	-	-	#	-	-	`	-	\	l	ø	L	Ø
C-	)	-	#	-	-	-	-	-	m	å	M	Å
D-	(	-	-	`	-	-	-	-	n	-	N	-
E-	-	-	%	-	ü	-	Y	-	o	;	O	;
F-	-	¤	_	-	-	-	-	-	p	*	P	*

FINNISH/SWEDISH (CP 278)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	¢	ä	å	é	0
1	-	-	-	-		`	/	\	a	j	ü	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	£	b	k	s	¥	B	K	S	2
3	-	-	-	-	í	ë	#	Ł	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	ł	d	m	u	®	D	M	U	4
5	-	-	-	-	á	í	Á	ƒ	e	n	v	[	E	N	V	5
6	-	-	-	-	ã	î	Ã	ţ	f	o	w	¶	F	O	W	6
7	-	-	-	-	}	ï	$	Ţ	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	ţ	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	é	i	r	z	¾	I	R	Z	9
A	-	-	-	-	§	¤	ö	:	«	ª	¡	¬	-	¹	²	³
B	-	-	-	-	.	Å	,	Ä	»	º	¿	¦	ô	û	ó	ù
C	-	-	-	-	<	*	%	ö	ð	æ	Ð	—	¦	~	@	Ü
D	-	-	-	-	(	)	_	'	ý	-	Ý	¨	ò	ù	ò	Ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	Ú
F	-	-	-	-	!	^	?	"	±	]	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	ä	-	Ä	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	ö	-	ö	d	t	D	T
4-	STP	/	4	:	-	-	-	-	e	u	E	U
5-	CR	£	5	+	-	-	-	-	f	v	F	V
6-		-	6	-	-	-	-	-	g	w	G	W
7-		-	7	-	-	-	-	-	h	x	H	X
8-	>	?	8	-	-	-	-	-	i	y	I	Y
9-	<	!	9	-	-	-	-	-	j	z	J	Z
A-	-	-	-	-	-	-	-	-	k	ä	K	Ä
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C-	)	-	§	-	-	-	-	-	m	å	M	Å
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F-	-	¤	_	-	-	-	-	-	p	*	P	*

ITALIAN (CP 280)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	-	-	-	-		]	/	é	a	j	ì	#	A	J	÷	1
2	-	-	-	-	â	ê	Â	Ê	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	{	}	À	È	d	m	u	©	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	@	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	\	~	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	ù	i	r	z	¾	I	R	Z	9
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C	-	-	-	-	<	*	%	§	ð	æ	Ð	¯	ö	ü	ö	Ü
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

-	0	1	2	3	4	5	6	7	8	9	A	B
0-			0	&	-	à	-	°	a	q	A	Q
1-	EM	=	1	-	-	-	-	-	b	r	B	R
2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	ò	-	ç	d	t	D	T
4-	STP	/	4	:	-	è	-	é	e	u	E	U
5-	CR	ç	5	+	à	â	£	-	f	v	F	V
6-		-	6	-	ò	-	§	ê	g	w	G	W
7-		ò	7	-	-	-	-	-	h	x	H	X
8-	>	?	8	°	à	-	A	-	i	y	I	Y
9-	<	!	9	-	è	-	E	-	j	z	J	Z
A-	°	$	ì	^	é	á	E	-	k	-	K	-
B-	é	-	§	ì	ì	-	I	-	l	-	L	-
C-	)	£	£	-	ò	-	O	-	m	-	M	-
D-	(	-	§	ù	ù	-	U	-	n	ì	N	ç
E-	è	-	%	è	-	-	-	-	o	;	O	;
F-	à	-	_	-	ç	-	C	-	p	*	P	*

JAPANESE/ENGLISH (CP 281)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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2	-	-	-	-	â	ê	Â	Ê	b	k	s	\	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	@	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	£	!	¦	:	«	ª	¡	^	-	¹	²	³
B	-	-	-	-	.	¥	,	#	»	º	¿	]	ô	û	ô	Ô
C	-	-	-	-	<	*	%	@	ð	æ	Ð	~	ö	ü	ö	Ü
D	-	-	-	-	(	)	_	'	ý	¸	Ý	¨	ò	ù	ò	Ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	Ú
F	-	-	-	-	¦	¬	?	"	±	¤	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

	0	1	2	3	4	5	6	7	8	9	A	B
0			0	&	a	k	w	â	a	q	A	Q
1	EM	=	1	-	b	l	x	ä	b	r	B	R
2	FF	'	2	.	c	m	y	à	c	s	C	S
3	NL	"	3	,	d	n	z	á	d	t	D	T
4	STP	/	4	:	e	o	¡	ã	e	u	E	U
5	CR	-	5	+	f	p	Ð	å	f	v	F	V
6		¦	6	¬	g	q	ý	ç	g	w	G	W
7		¦	7	¯	h	r	þ	ñ	h	x	H	X
8	>	?	8	-	i	ª	@	é	i	y	I	Y
9	<	!	9	-	«	º	^	ê	j	z	J	Z
A	-	$	-	-	ð	Æ	]	ë	k	-	K	-
B	-	-	-	-	ý	¤	~	è	l	-	L	-
C	)	£	#	-	þ	s	¨	í	m	-	M	-
D	(	¥	@	`	±	t	´	î	n	-	N	-
E	}	-	%	-	•	u	×	ì	o	;	O	;
F	{	-	_	-	j	v		"	p	*	P	*

SPANISH (CP 284)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	¢	{	}	\	0
1	-	-	-	-		é	/	£	a	j	¨	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	£	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	£	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	©	D	M	U	4
5	-	-	-	-	á	í	Á	f	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	f	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	¦	ß	#	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	[	]	ñ	:	«	ª	¡	^	-	¹	²	³
B	-	-	-	-	.	$	,	Ñ	»	º	¿	!	ô	û	ô	Ô
C	-	-	-	-	<	*	%	@	ð	æ	Ð	¯	ö	ü	õ	Õ
D	-	-	-	-	(	)	_	'	ý	¸	Ý	~	ò	ù	ò	Ò
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	ó	Ú
F	-	-	-	-	¦	¬	?	"	±	¤	®	×	õ	ÿ	õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

¦	0	1	2	3	4	5	6	7	8	9	A	B
0¦			0	&	à	ä	À	Ä	a	q	A	Q
1¦	EM	=	1	-	è	ë	È	Ë	b	r	B	R
2¦	FF	'	2	.	ì	ï	Ì	Ï	c	s	C	S
3¦	NL	"	3	,	ò	ö	Ò	Ö	d	t	D	T
4¦	STP	/	4	:	ù	ü	Ù	Ü	e	u	E	U
5¦	CR	\	5	+	ã	â	Ã	Â	f	v	F	V
6¦		¦	6	¬	õ	ê	Õ	Ê	g	w	G	W
7¦		¦	7	¯	ÿ	î	±	Î	h	x	H	X
8¦	>	?	8	°	þ	ô	Þ	Ô	i	y	I	Y
9¦	<	!	9	µ	ð	û	Ð	Û	j	z	J	Z
A¦	[	$	ß	^	«	á	-	Á	k	æ	K	Æ
B¦	]	¢	§	~	¡	é	¿	É	l	ø	L	Ø
C¦	)	£	#	¨	»	í	¡	Í	m	å	M	Å
D¦	(	¥	@	`	¶	ó	ª	Ó	n	ç	N	Ç
E¦	}	·	%	´	ý	ú	Ý	Ú	o	²	O	;
F¦	{	¤	_	¸	×	ñ	º	Ñ	p	³	P	*

ENGLISH U.K. (CP 285)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	ø	Ø	°	µ	¢	{	}	\	0
1	-	-	-	-		é	/	£	a	j		[	A	J	÷	1
2	-	-	-	-	â	ê	Â	£	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	@	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	Ñ	ß	Ñ	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	$	!	¦	:	«	ª	¡	^	-	¹	²	³
B	-	-	-	-	.	£	,	#	»	º	¿	]	õ	û	Õ	Û
C	-	-	-	-	<	*	%	@	ð	æ	Ð	~	ö	ü	Ö	Ü
D	-	-	-	-	(	)	_	'	ý	¸	Ý	¨	ò	ù	Ò	Ù
E	-	-	-	-	+	;	>	=	þ	Æ	Þ	´	ó	ú	Ó	Ú
F	-	-	-	-	¦	¬	?	"	±	¤	®	×	õ	ÿ	Õ	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

	0	1	2	3	4	5	6	7	8	9	A	B
0			0	&	-	-	-	-	a	q	A	Q
1	EM	=	1	-	-	-	-	-	b	r	B	R
2	FF	'	2	.	-	-	-	-	c	s	C	S
3	NL	"	3	,	-	-	-	-	d	t	D	T
4	STP	/	4	:	-	-	-	-	e	u	E	U
5	CR	\	5	+	-	-	-	-	f	v	F	V
6		¦	6	¬	-	-	-	-	g	w	G	W
7		¦	7	¯	-	-	-	-	h	x	H	X
8	>	?	8	-	-	-	-	-	i	y	I	Y
9	<	!	9	-	-	-	-	-	j	z	J	Z
A	-	$	-	-	-	-	-	-	k	-	K	-
B	-	$	-	-	-	-	-	-	l	-	L	-
C	)	£	#	-	-	-	-	-	m	-	M	-
D	(	-	@	`	-	-	-	-	n	-	N	-
E	}	£	%	-	-	-	-	-	o	;	O	;
F	{	-	_	-	-	"	-	#	p	*	P	*

AUSTRIAN/GERMAN ALT. (CP 286)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	-	-	-	-	-	-	-	-	0
1	-	-	-	-	-	-	/	-	a	j	-	-	A	J	-	1
2	-	-	-	-	-	-	-	-	b	k	s	-	B	K	S	2
3	-	-	-	-	-	-	-	-	c	l	t	-	C	L	T	3
4	-	-	-	-	-	-	-	-	d	m	u	-	D	M	U	4
5	-	-	-	-	-	-	-	-	e	n	v	-	E	N	V	5
6	-	-	-	-	-	-	-	-	f	o	w	-	F	O	W	6
7	-	-	-	-	-	-	-	-	g	p	x	-	G	P	X	7
8	-	-	-	-	-	-	-	-	h	q	y	-	H	Q	Y	8
9	-	-	-	-	-	-	-	-	i	r	z	-	I	R	Z	9
A	-	-	-	-	ö	ü	ß	:	-	-	-	-	-	-	-	-
B	-	-	-	-	.	Ü	,	Ä	-	-	-	-	-	-	-	-
C	-	-	-	-	<	*	%	ö	-	-	-	-	-	-	-	-
D	-	-	-	-	(	)	_	'	-	-	-	-	-	-	-	-
E	-	-	-	-	+	;	>	=	-	-	-	-	-	-	-	-
F	-	-	-	-	¦	¬	?	ä	-	-	-	-	-	-	-	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

¦	0	1	2	3	4	5	6	7	8	9	A	B
0¦			0	&	-	ä	-	-	a	q	A	Q
1¦	EM	=	1	-	-	-	-	-	b	r	B	R
2¦	FF	'	2	.	-	-	-	-	c	s	C	S
3¦	NL	ä	3	,	-	ö	-	ö	d	t	D	T
4¦	STP	/	4	:	-	ü	-	Ü	e	u	E	U
5¦	CR	ö	5	+	-	-	-	-	f	v	F	V
6¦		¦	6	¬	-	-	-	-	g	w	G	W
7¦		ß	7	-	-	-	-	-	h	x	H	X
8¦	>	?	8	-	-	-	-	-	i	y	I	Y
9¦	<	ü	9	-	-	-	-	-	j	z	J	Z
A¦	ö	Ü	ß	-	-	-	-	-	k	ä	K	-
B¦	ü	ö	-	ß	-	-	-	-	l	ö	L	ö
C¦	)	-	-	ß	-	-	-	-	m	ü	M	Ü
D¦	(	-	ö	-	-	-	-	-	n	-	N	-
E¦	ü	Ü	%	-	-	-	-	-	o	;	O	;
F¦	ä	-	_	-	-	ß	-	-	p	*	P	*

DANISH/NORWEGIAN ALT. (CP 287)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	-	-	-	-	-	-	-	-	0
1	-	-	-	-	-	-	/	-	a	j	-	-	A	J	-	1
2	-	-	-	-	-	-	-	-	b	k	s	-	B	K	S	2
3	-	-	-	-	-	-	-	-	c	l	t	-	C	L	T	3
4	-	-	-	-	-	-	-	-	d	m	u	-	D	M	U	4
5	-	-	-	-	-	-	-	-	e	n	v	-	E	N	V	5
6	-	-	-	-	-	-	-	-	f	o	w	-	F	O	W	6
7	-	-	-	-	-	-	-	-	g	p	x	-	G	P	X	7
8	-	-	-	-	-	-	-	-	h	q	y	-	H	Q	Y	8
9	-	-	-	-	-	-	-	-	i	r	z	-	I	R	Z	9
A	-	-	-	-	ø	å	¦	:	-	-	-	-	-	-	-	-
B	-	-	-	-	.	Å	,	Æ	-	-	-	-	-	-	-	-
C	-	-	-	-	<	*	%	Ø	-	-	-	-	-	-	-	-
D	-	-	-	-	(	)	_	'	-	-	-	-	-	-	-	-
E	-	-	-	-	+	;	>	=	-	-	-	-	-	-	-	-
F	-	-	-	-	¦	¬	?	æ	-	-	-	-	-	-	-	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

¦	0	1	2	3	4	5	6	7	8	9	A	B
0¦			0	&	-	æ	-	Æ	a	q	A	Q
1¦	EM	=	1	-	-	-	-	-	b	r	B	R
2¦	FF	'	2	.	-	-	-	-	c	s	C	S
3¦	NL	æ	3	,	-	ø	-	Ø	d	t	D	T
4¦	STP	/	4	:	-	å	-	Å	e	u	E	U
5¦	CR	-	5	+	-	-	-	-	f	v	F	V
6¦		¦	6	¬	-	-	-	-	g	w	G	W
7¦		¦	7	-	-	-	-	-	h	x	H	X
8¦	>	?	8	-	-	-	-	-	i	y	I	Y
9¦	<	ã	9	-	-	-	-	-	j	z	J	Z
A¦	ø	Å	¦	-	-	-	-	-	k	æ	K	Æ
B¦	å	ø	-	-	-	-	-	-	l	ø	L	Ø
C¦	)	-	Æ	-	-	-	-	-	m	å	M	Å
D¦	(	-	Ø	-	-	-	-	-	n	-	N	-
E¦	-	Å	%	-	-	-	-	-	o	;	O	;
F¦	-	-	_	-	-	¦	-	Æ	p	*	P	*

FINNISH/SWEDISH ALT. (CP 288)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	-	-	-	-	-	-	-	-	0
1	-	-	-	-	-	-	/	-	a	j	-	-	A	J	-	1
2	-	-	-	-	-	-	-	-	b	k	s	-	B	K	S	2
3	-	-	-	-	-	-	-	-	c	l	t	-	C	L	T	3
4	-	-	-	-	-	-	-	-	d	m	u	-	D	M	U	4
5	-	-	-	-	-	-	-	-	e	n	v	-	E	N	V	5
6	-	-	-	-	-	-	-	-	f	o	w	-	F	O	W	6
7	-	-	-	-	-	-	-	-	g	p	x	-	G	P	X	7
8	-	-	-	-	-	-	-	-	h	q	y	-	H	Q	Y	8
9	-	-	-	-	-	-	-	-	i	r	z	-	I	R	Z	9
A	-	-	-	-	ö	å	¦	:	-	-	-	-	-	-	-	-
B	-	-	-	-	.	Å	,	Ä	-	-	-	-	-	-	-	-
C	-	-	-	-	<	*	%	ö	-	-	-	-	-	-	-	-
D	-	-	-	-	(	)	_	'	-	-	-	-	-	-	-	-
E	-	-	-	-	+	;	>	=	-	-	-	-	-	-	-	-
F	-	-	-	-	¦	¬	?	ä	-	-	-	-	-	-	-	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

¦	0	1	2	3	4	5	6	7	8	9	A	B
0¦			0	&	-	ä	-	Ä	a	q	A	Q
1¦	EM	=	1	-	-	-	-	-	b	r	B	R
2¦	FF	'	2	.	-	-	-	-	c	s	C	S
3¦	NL	ä	3	,	-	ö	-	ö	d	t	D	T
4¦	STP	/	4	:	-	å	-	Å	e	u	E	U
5¦	CR	-	5	+	-	-	-	-	f	v	F	V
6¦		¦	6	¬	-	-	-	-	g	w	G	W
7¦		¦	7	-	-	-	-	-	h	x	H	X
8¦	>	?	8	-	-	-	-	-	i	y	I	Y
9¦	<	å	9	-	-	-	-	-	j	z	J	Z
A¦	ö	Å	¦	-	-	-	-	-	k	ä	K	Ä
B¦	å	ö	-	-	-	-	-	-	l	ö	L	ö
C¦	)	-	Ä	-	-	-	-	-	m	å	M	Å
D¦	(	-	ö	-	-	-	-	-	n	-	N	-
E¦	-	Å	%	-	-	-	-	-	o	;	O	;
F¦	-	-	_	-	-	¦	-	Ä	p	*	P	*

SPANISH ALT. (CP 289)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	-	-	-	-		&	-	-	-	-	-	-	-	-	-	0
1	-	-	-	-	-	-	/	-	a	j	-	-	A	J	-	1
2	-	-	-	-	-	-	-	-	b	k	s	-	B	K	S	2
3	-	-	-	-	-	-	-	-	c	l	t	-	C	L	T	3
4	-	-	-	-	-	-	-	-	d	m	u	-	D	M	U	4
5	-	-	-	-	-	-	-	-	e	n	v	-	E	N	V	5
6	-	-	-	-	-	-	-	-	f	o	w	-	F	O	W	6
7	-	-	-	-	-	-	-	-	g	p	x	-	G	P	X	7
8	-	-	-	-	-	-	-	-	h	q	y	-	H	Q	Y	8
9	-	-	-	-	-	-	-	-	i	r	z	-	I	R	Z	9
A	-	-	-	-	¢	!	¦	:	-	-	-	-	-	-	-	-
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E	-	-	-	-	+	;	>	=	-	-	-	-	-	-	-	-
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

	0	1	2	3	4	5	6	7	8	9	A	B
0			0	&	-	-	-	-	a	q	A	Q
1	EM	=	1	-	-	-	-	-	b	r	B	R
2	FF	'	2	.	-	-	-	-	c	s	C	S
3	NL	ñ	3	,	-	-	-	-	d	t	D	T
4	STP	/	4	:	-	-	-	-	e	u	E	U
5	CR	-	5	+	-	-	-	-	f	v	F	V
6		¦	6	¬	-	-	-	-	g	w	G	W
7		¦	7	-	-	-	-	-	h	x	H	X
8	>	?	8	-	-	-	-	-	i	y	I	Y
9	<	!	9	-	-	-	-	-	j	z	J	Z
A	-	¢	-	-	-	-	-	-	k	-	K	-
B	-	¢	-	-	-	-	-	-	l	-	L	-
C	)	-	Ñ	-	-	-	-	-	m	-	M	-
D	(	-	@	-	-	-	-	-	n	-	N	-
E	-	-	%	-	-	-	-	-	o	;	O	;
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FRENCH/FRENCH-AZERTY (CP 297)

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2	-	-	-	-	â	ê	Â	Ê	b	k	s	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	@	}	À	È	d	m	u	@	D	M	U	4
5	-	-	-	-	á	í	Á	Í	e	n	v	]	E	N	V	5
6	-	-	-	-	ã	î	Ã	Î	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	g	p	x	¼	G	P	X	7
8	-	-	-	-	\	ì	Ç	Ì	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	µ	i	r	z	¾	I	R	Z	9
A	-	-	-	-	°	§	ù	:	«	ª	¡	¬	-	¹	²	³
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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0-			0	&	-	ä	-	-	a	q	A	Q
1-	EM	=	1	-	-	ë	-	-	b	r	B	R
2-	FF	'	2	.	-	ï	-	-	c	s	C	S
3-	NL	"	3	,	-	ö	-	-	d	t	D	T
4-	STP	/	4	:	-	ü	-	-	e	u	E	U
5-	CR	-	5	+	-	â	-	-	f	v	F	V
6-		-	6	-	-	ê	-	-	g	w	G	W
7-		-	7	-	ÿ	î	-	-	h	x	H	X
8-	>	?	8	°	à	ô	A	-	i	y	I	Y
9-	<	!	9	µ	è	û	E	-	j	z	J	Z
A-	*	$	-	^	é	-	E	-	k	-	K	-
B-	§	-	§	-	-	-	-	-	l	-	L	-
C-	)	£	£	¨	-	-	-	-	m	-	M	-
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ICELANDIC (CP 871)

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3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	·	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	©	D	M	U	4
5	-	-	-	-	á	í	Á	f	e	n	v	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	f	f	o	w	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	f	g	p	x	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	Í	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	ð	i	r	z	¾	I	R	Z	9
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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1¦	EM	=	1	-	«	ë	½	Ë	b	r	B	R
2¦	FF	'	2	.	ª	ï	È	Ï	c	s	C	S
3¦	NL	"	3	,	º	ö	×	Ö	d	t	D	T
4¦	STP	/	4	:	µ	ü	è	Ü	e	u	E	U
5¦	CR	\	5	+	à	â	À	Å	f	v	F	V
6¦		¦	6	¬	ì	ê	Î	Ê	g	w	G	W
7¦		¦	7	¯	ý	î	Ý	Î	h	x	H	X
8¦	>	?	8	°	ô	ô	ô	ô	i	y	I	Y
9¦	<	!	9	±	©	û	õ	Û	j	z	J	Z
A¦	[	$	ß	^	ð	á	Ð	Á	k	æ	K	Æ
B¦	]	¢	§	~	þ	é	Þ	É	l	ø	L	Ø
C¦	)	£	#	¨	¶	í	ù	Í	m	å	M	Å
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E¦	}	·	%	´	ã	ú	³	Ú	o	;	O	;
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ARABIC X/B (CP 420)

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2	-	-	-	-	ّ	ﺆ	ة	ﺨ	b	k	s	ﻸ	B	K	S	2
3	-	-	-	-	ﹽ	-	ﺗ	ﺩ	c	l	t	ﻷ	C	L	T	3
4	-	-	-	-	ـ	-	ﺘ	ﺫ	d	m	u	ﻺ	D	M	U	4
5	-	-	-	-	ـ	ﺋ	ﺛ	ﺭ	e	n	v	ﻹ	E	N	V	5
6	-	-	-	-	ء	ا	ﺜ	ﺯ	f	o	w	-	F	O	W	6
7	-	-	-	-	آ	ﺎ	ﺝ	ﺱ	g	p	x	-	G	P	X	7
8	-	-	-	-	ﺂ	ﺏ	ﺠ	ﺴ	h	q	y	ﻼ	H	Q	Y	8
9	-	-	-	-	أ	ﺑ	ﺣ	،	i	r	z	ﻻ	I	R	Z	9
A	-	-	-	-	¢	!	ﺤ	:	ﺸ	ﻉ	ﻐ	ﻟ	-	ى	١	-
B	-	-	-	-	.	$	,	#	ﺻ	ﻊ	ﻓ	ﻣ	ﻫ	ﻰ	٢	٦
C	-	-	-	-	<	*	%	@	ﺼ	ﻌ	ﻔ	ﻤ	-	ﻱ	-	٧
D	-	-	-	-	(	)	_	'	ﺿ	ﻋ	ﻕ	ﻥ	ﻬ	ﻲ	٣	٨
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

	0	1	2	3	4	5	6	7	8	9	A	B
0			0	&	ﺎ	ﺭ	ﻉ	٩	a	q	A	Q
1	EM	=	1	-	ﺏ	ﺯ	ﻍ	ﻻ	b	r	B	R
2	FF	´	2	.	ﺑ	ﺱ	ﻋ	ﻼ	c	s	C	S
3	NL	"	3	,	ة	ﺳ	ﻏ	ﻟ	d	t	D	T
4	STP	/	4	:	ﺕ	ﺵ	ﻑ	ﻣ	e	u	E	U
5	CR	×	5	+	ﺗ	ﺷ	ﻓ	ﻤ	f	v	F	V
6		|	6	¬	ﺙ	ﺹ	ﻕ	ﻥ	g	w	G	W
7		¦	7	أ	ﺛ	ﺻ	ﻗ	ﻧ	h	x	H	X
8	>	?	8	ﺄ	ﺝ	ﺽ	ﻙ	ه	i	y	I	Y
9	<	!	9	ﺆ	ﺟ	ﺿ	ﻛ	ﻱ	j	z	J	Z
A	ﻭ	$	آ	-	ﺡ	ﻁ	ﻝ	ﻫ	k	•	K	٤
B	ّ	¢	ﺂ	÷	ﺣ	ﻅ	ﻵ	ﻳ	l	١	L	٦
C	)	ﹽ	#	-	ﺥ	ع	ﻷ	ﻬ	m	٢	M	٧
D	(	_	@	,	ﺧ	ﻊ	ﻹ	ى	n	٣	N	٨
E	؟	ـ	%	ﺋ	ﺩ	ﻌ	ﻶ	ﻰ	o	;	O	;
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GREEK OLD (CP 423)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	-	-	-	-	A	K	/	ά	a	j	¨	ὰ	Ά	J	-	1
2	-	-	-	-	B	Λ	T	Έ	b	k	s	έ	B	K	S	2
3	-	-	-	-	Γ	M	T	Ή	c	l	t	ή	C	L	T	3
4	-	-	-	-	Δ	N	Φ		d	m	u	ϊ	D	M	U	4
5	-	-	-	-	E	Ξ	X	Ί	e	n	v	ί	E	N	V	5
6	-	-	-	-	Z	O	Ψ	ὸ	f	o	w	ό	F	O	W	6
7	-	-	-	-	H	Π	Ω	Ύ	g	p	x	ύ	G	P	X	7
8	-	-	-	-	Θ	P	-	ὼ	h	q	y	ϋ	H	Q	Y	8
9	-	-	-	-	I	Σ	-	`	i	r	z	ώ	I	R	Z	9
A	-	-	-	-	[	]	¦	:	α	η	ν	ς	-	±	½	ÿ
B	-	-	-	-	.	$	,	£	β	θ	ξ	τ	ω	é	ö	ç
C	-	-	-	-	<	*	%	§	γ	ι	o	υ	â	è	ô	Ç
D	-	-	-	-	(	)	_	'	δ	κ	π	ø	à	ë	û	-
E	-	-	-	-	+	;	>	=	ε	λ	ρ	χ	ä	î	ù	-
F	-	-	-	-	!	^	?	"	ζ	μ	σ	ψ	ê	ï	ü	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

ê	0	1	2	3	4	5	6	7	8	9	A	B
0ê			0	&	ά	λ	Ὰ	Λ	a	q	A	Q
1ê	EM	=	1	-	έ	μ	Έ	M	b	r	B	R
2ê	FF	'	2	.	ή	ν	Ή	N	c	s	C	S
3ê	NL	"	3	,	ό	ξ	Ὸ	Ξ	d	t	D	T
4ê	STP	/	4	:	ί	ώ	Ί	Ὼ	e	u	E	U
5ê	CR	â	5	+	ύ	o	Ύ	O	f	v	F	V
6ê		ê	6	ô	α	π	A	Π	g	w	G	W
7ê		î	7	û	β	ρ	B	P	h	x	H	X
8ê	>	?	8	•	γ	σ	Γ	Σ	i	y	I	Y
9ê	<	!	9	ë	δ	τ	Δ	T	j	z	J	Z
Aê	[	$	ϊ	^	ε	υ	E	T	k	ä	K	Ά
Bê	]	é	§	ΰ	ζ	ø	Z	Φ	l	ï	L	ÿ
Cê	)	£	Ç	¨	η	χ	H	X	m	ö	M	ö
Dê	(	à	ç	`	θ	ψ	Θ	Ψ	n	ü	N	Ü
Eê	±	è	%	'	ι	ω	I	Ω	o	;	O	;
Fê	½	ù	_	¸	κ	ς	K	Σ	p	*	P	*

Hebrew (CP 424)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	-	-	-	-	א	'	/	ת	a	j	~	£	A	J	÷	1
2	-	-	-	-	ב	ך	ע	-	b	k	s	¥	B	K	S	2
3	-	-	-	-	ג	כ	ף	-	c	l	t	•	C	L	T	3
4	-	-	-	-	ד	ל	פ		d	m	u	@	D	M	U	4
5	-	-	-	-	ה	ם	ץ	-	e	n	v	§	E	N	V	5
6	-	-	-	-	ו	מ	צ	-	f	o	w	¶	F	O	W	6
7	-	-	-	-	ז	ן	ק	-	g	p	x	¼	G	P	X	7
8	-	-	-	-	ח	נ	ר	‗	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ט	ס	ש	`	i	r	z	¾	I	R	Z	9
A	-	-	-	-	¢	!	¦	:	«	-	-	[	-	¹	²	³
B	-	-	-	-	.	$	,	#	»	-	-	]	-	-	-	-
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

	0	1	2	3	4	5	6	7	8	9	A	B
0			0	&	א	ן	-	-	a	q	A	Q
1	EM	=	1	-	ב	ס	-	-	b	r	B	R
2	FF	'	2	.	ג	ע	-	-	c	s	C	S
3	NL	"	3	,	ד	ף	-	-	d	t	D	T
4	STP	/	4	:	ה	פ	-	-	e	u	E	U
5	CR	\	5	+	ו	ץ	-	-	f	v	F	V
6		¦	6	¬	ז	צ	-	-	g	w	G	W
7		¦	7	-	ח	ק	±	-	h	x	H	X
8	>	?	8	•	ט	ר	‗	-	i	y	I	Y
9	<	!	9	µ	י	ש	-	-	j	z	J	Z
A	(	$	-	^	ך	ת	-	-	k	-	K	-
B	]	¢	§	~	כ	@	²	-	l	•	L	-
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HEBREW (CP 803)

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2	-	-	-	-	â	ê	Â	£	ג	כ	ן	¥	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	ד	ל	ם	•	C	L	T	3
4	-	-	-	-	à	è	À	È	ה	ם	ף	®	D	M	U	4
5	-	-	-	-	á	í	Á	í	ו	מ	ץ	§	E	N	V	5
6	-	-	-	-	ã	î	Ã	î	ז	ן	ף	¶	F	O	W	6
7	-	-	-	-	å	ï	Å	Ï	ח	נ	ך	¼	G	P	X	7
8	-	-	-	-	ç	ì	Ç	ì	ט	ס	ש	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	^	י	ע	ת	¾	I	R	Z	9
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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2	FF	'	2	.	ג	ע	½	×	ß	ª	C	S
3	NL	"	3	,	ד	ף	¾	-	Å	º	D	T
4	STP	/	4	:	ה	פ	¬	ô	Ä	æ	E	U
5	CR	\	5	+	ו	ץ	¡	ö	À		F	V
6		)	6	¬	ז	צ	—	ó	Á	Æ	G	W
7		!	7	₪	ח	ק	ô	¹	Ã	¤	H	X
8	>	?	8	é	ט	ר	²	¿	Å	µ	I	Y
9	<	!	9	â	י	ש	û	ù	È	¡	J	Z
A		$	ý	ë	ך	ת	³	Ð	í	Ç	K	¥
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D	(	à	@	^	ם	á	£	®	ì	ü	N	§
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LATIN 2/ROECE (CP 870)

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3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	Ţ	C	L	T	3
4	-	-	-	-	ţ	ů	˝	Ů	d	m	u	Ż	D	M	U	4
5	-	-	-	-	á	í	Á	ł	e	n	v	§	E	N	V	5
6	-	-	-	-	ă	î	Ă	Î	f	o	w	ž	F	O	W	6
7	-	-	-	-	č	Ť	Č	Ľ	g	p	x	ź	G	P	X	7
8	-	-	-	-	ç	Ť	Ç	Ľ	h	q	y	ž	H	Q	Y	8
9	-	-	-	-	ć	ß	Ć	`	i	r	z	ź	I	R	Z	9
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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2"	FF	´	2	.	š	ő	Š	Ő	c	s	C	S
3"	NL	"	3	,	ž	ö	Ž	Ö	d	t	D	T
4"	STP	/	4	:	ć	ü	Ć	Ü	e	u	E	U
5"	CR	.	5	+	ż	ś	Ż	Ś	f	v	F	V
6"		˝	6	-	ę	ű	Ę	Ű	g	w	G	W
7"		~	7	˘	ý	ź	Ý	Ź	h	x	H	X
8"	>	?	8	°	ľ	ô	Ľ	Ô	i	y	I	Y
9"	<	!	9	˛	ă	ť	Ă	Ť	j	z	J	Z
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GREEK NEW (CP 875)

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3	-	-	-	-	Γ	Μ	Τ	Ή	c	l	t	ή	C	L	T	3
4	-	-	-	-	Δ	Ν	Φ		d	m	u	ϊ	D	M	U	4
5	-	-	-	-	Ε	Ξ	Χ	Ί	e	n	v	ί	E	N	V	5
6	-	-	-	-	Ζ	Ο	Ψ	Ό	f	o	w	ό	F	O	W	6
7	-	-	-	-	Η	Π	Ω	Ύ	g	p	x	ύ	G	P	X	7
8	-	-	-	-	Θ	Ρ	Ϊ	Ώ	h	q	y	ϋ	H	Q	Y	8
9	-	-	-	-	Ι	Σ	Ϋ	'	i	r	z	ώ	I	R	Z	9
A	-	-	-	-	[	]	¦	:	α	η	ν	ς	-	±	²	³
B	-	-	-	-	.	$	,	#	β	θ	ξ	τ	ω	½	§	ΐ
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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1¦	EM	=	1	-	έ	μ	Έ	Μ	b	r	B	R
2¦	FF	'	2	.	ή	ν	Ή	Ν	c	s	C	S
3¦	NL	"	3	,	ό	ξ	Ό	Ξ	d	t	D	T
4¦	STP	/	4	:	ί	ώ	Ί	ΐ	e	u	E	U
5¦	CR	\	5	+	ύ	ο	Ύ	Ο	f	v	F	V
6¦		¦	6	¬	α	π	Α	Π	g	w	G	W
7¦		¦	7	-	β	ρ	Β	Ρ	h	x	H	X
8¦	>	?	8	•	γ	σ	Γ	Σ	i	y	I	Y
9¦	<	!	9	«	δ	τ	Δ	Τ	j	z	J	Z
A¦	[	$	ή	^	ε	υ	Ε	Τ	k	{	K	}
B¦	]	ΐ	§	ϋ	ζ	φ	Ζ	Φ	l	ΰ	L	ϋ
C¦	)	£	#	¨	η	χ	Η	Χ	m	-	M	²
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CYRILLIC (CP 880)

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2	-	-	-	-	Ђ	ъ	ѓ	Ќ	b	k	s	з	B	K	S	2
3	-	-	-	-	ѓ	ћ	Ѕ	-	c	l	t	ш	C	L	T	3
4	-	-	-	-	ё	ќ	Є	Ў	d	m	u	э	D	M	U	4
5	-	-	-	-	е	ў	S	Ц	e	n	v	щ	E	N	V	5
6	-	-	-	-	s	ц	I	ъ	f	o	w	ч	F	O	W	6
7	-	-	-	-	i	Ъ	Ї	a	g	p	x	ъ	G	P	X	7
8	-	-	-	-	ї	Ю	J	б	h	q	y	Ю	H	Q	Y	8
9	-	-	-	-	j	Ђ	Љ	`	i	r	z	A	I	R	Z	9
A	-	-	-	-	[	]	¦	:	д	к	p	Б	X	H	T	З
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

	0	1	2	3	4	5	6	7	8	9	A	B
0			0	&	a	п	A	П	a	q	A	Q
1	EM	=	1	-	б	р	Б	Р	b	r	B	R
2	FF	´	2	.	в	с	В	С	c	s	C	S
3	NL	"	3	,	г	т	Г	Т	d	t	D	T
4	STP	/	4	:	д	ё	Д	Ё	e	u	E	U
5	CR	\	5	+	j	у	J	У	f	v	F	V
6		¦	6	ц	е	ф	Е	Ф	g	w	G	W
7		i	7	ќ	ж	х	Ж	Х	h	x	H	X
8	>	?	8	Ђ	з	ц	З	Ц	i	y	I	Y
9	<	!	9	ѓ	и	ч	И	Ч	j	z	J	Z
A	[	$	I	^	й	ш	и	Ш	k	я	K	Я
B	]	ъ		Ъ	к	щ	К	Щ	l	ъ	L	ъ
C	)	ћ	#	Ћ	л	ы	Л	Ы	m	ї	M	Ї
D	(	ћ	@	Ћ	м	ь	М	b	n	s	N	S
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YUGOSLAV (CP 890)

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2	-	-	-	-	â	ę	Â	Ę	b	k	s	ż	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	Ţ	C	L	T	3
4	-	-	-	-	à	ů	À	Ů	d	m	u	ż	D	M	U	4
5	-	-	-	-	á	í	Á	ĺ	e	n	v	§	E	N	V	5
6	-	-	-	-	ă	î	Ă	ţ	f	o	w	'	F	O	W	6
7	-	-	-	-	˜	Ľ	^	Ľ	g	p	x	ź	G	P	X	7
8	-	-	-	-	ç	Ĺ	Ç	Ł	h	q	y	@	H	Q	Y	8
9	-	-	-	-	Đ	ß	]	ž	i	r	z	ź	I	R	Z	9
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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1˜	EM	=	1	-	ă	ë	ů	Ë	b	r	B	R
2˜	FF	´	2	.	š	n	š	ő	c	s	C	S
3˜	NL	"	3	,	ž	ö	ž	ö	d	t	D	T
4˜	STP	/	4	:	ć	ü	ć	Ü	e	u	E	U
5˜	CR	'	5	+	ż	â	ţ	Á	f	v	F	V
6˜		˜	6	ě	ę	ř	Ă	Ű	g	w	G	W
7˜		ť	7	˘	ý	î	ý	ţ	h	x	H	X
8˜	>	?	8	•	ń	ô	Ľ	ð	i	y	I	Y
9˜	<	!	9	˛	ş	ŕ	Ş	Ť	j	z	J	Z
A˜	[	$	ß	^	đ	á	Đ	Á	k	ű	K	ő
B˜	]	ź	§	¸	ľ	é	Ľ	É	l	ů	L	ð
C˜	)	ź	#	¨	Ľ	í	Ň	ĺ	m	ŕ	M	Ą
D˜	(	ż	@	•	ą	ó	ř	ó	n	ç	N	Ç
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TURKISH OLD (CP 905)

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1	-	-	-	-		é	/	ť	a	j	ö	£	A	J	÷	1
2	-	-	-	-	â	ê	Â	Ť	b	k	s	ż	B	K	S	2
3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	}	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	ż	D	M	U	4
5	-	-	-	-	á	í	Á	ť	e	n	v	§	E	N	V	5
6	-	-	-	-	-	î	-	Ť	f	o	w	]	F	O	W	6
7	-	-	-	-	ċ	ï	Ċ	Ť	g	p	x	-	G	P	X	7
8	-	-	-	-	{	ì	[	ţ	h	q	y	½	H	Q	Y	8
9	-	-	-	-	ñ	ß	Ñ	ı	i	r	z	¤	I	R	Z	9
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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2ĝ	FF	´	2	.	ì	ï	Ì	Ï	c	s	C	S
3ĝ	NL	U	3	,	ò	~	Ò	#	d	t	D	T
4ĝ	STP	/	4	:	ù	\	Ù	"	e	u	E	U
5ĝ	CR	ü	5	+	-	â	-	Â	f	v	F	V
6ĝ		ĝ	6	Ĥ	ĝ	ê	ĝ	Ê	g	w	G	W
7ĝ		ş	7	-	-	î	ĭ	Ì	h	x	H	X
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9ĝ	<	!	9	µ	ŝ	û	ŝ	Û	j	z	J	Z
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DCF Compatibility (CP 1002)

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1	-	-	-	-		-	/	-	a	j	-	-	A	J	-	1
2	-	-	-	-	-	-	-	-	b	k	s	-	B	K	S	2
3	-	-	-	-	-	-	-	-	c	l	t	-	C	L	T	3
4	-	-	-	-	-	-	-	-	d	m	u	-	D	M	U	4
5	-	-	-	-	-	-	-	-	e	n	v	-	E	N	V	5
6	-	-	-	-	-	-	-	-	f	o	w	-	F	O	W	6
7	-	-	-	-	-	-	-	-	g	p	x	-	G	P	X	7
8	-	-	-	-	-	-	-	-	h	q	y	-	H	Q	Y	8
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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1┘	EM	=	1	-	-	-	-	-	b	r	B	R
2┘	FF	'	2	.	-	-	-	-	c	s	C	S
3┘	NL	"	3	,	-	┬	-	┤	d	t	D	T
4┘	STP	/	4	:	-	§	-	-	e	u	E	U
5┘	CR	\	5	+	-	-	-	-	f	v	F	V
6┘		┘	6	-	-	-	-	-	g	w	G	W
7┘		-	7	-	-	-	┼	-	h	x	H	X
8┘	>	?	8	-	-	┴	-	├	i	y	I	Y
9┘	<	¦	9	-	≤	-	┌	-	j	z	J	Z
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B┘	!	-	-	-	-	-	└	-	l	-	L	-
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CYRILLIC MULTINATIONAL (CP 1025)

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1	-	-	-	-		љ	/	ћ	а	j	~	ы	A	J		1
2	-	-	-	-	ђ	њ	ѓ	ќ	b	k	s	з	B	K	S	2
3	-	-	-	-	ѓ	ћ	Ё	-	c	l	t	ш	C	L	T	3
4	-	-	-	-	ё	ќ	Є	ў	d	m	u	э	D	M	U	4
5	-	-	-	-	є	ў	S	Џ	e	n	v	щ	E	N	V	5
6	-	-	-	-	s	џ	I	ю	f	o	w	ч	F	O	W	6
7	-	-	-	-	i	ъ	Ї	а	g	p	x	ъ	G	P	X	7
8	-	-	-	-	ї	№	J	б	h	q	y	Ю	H	Q	Y	8
9	-	-	-	-	j	ђ	љ	`	i	r	z	А	I	R	Z	9
A	-	-	-	-	Ґ	J	!	:	д	к	§	Б	X	H	T	З
B	-	-	-	-	.	$	,	#	е	л	c	Ц	И	O	У	Ш
C	-	-	-	-	<	*	%	@	ф	м	т	Д	Й	П	Ж	Э
D	-	-	-	-	(	)	_	'	г	н	у	Е	К	Я	В	Щ
E	-	-	-	-	+	;	>	=	х	о	ж	ф	Л	Р	b	Ч
F	-	-	-	-	!	^	?	"	и	п	в	Г	М	С	Ы	-

DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

	0	1	2	3	4	5	6	7	8	9	A	B
0			0	&	a	n	A	П	a	q	A	Q
1	EM	=	1	-	б	§	Б	Р	b	r	B	R
2	FF	'	2	.	в	c	В	С	c	s	C	S
3	NL	"	3	,	г	т	Г	Т	d	t	D	T
4	STP	/	4	:	д	ё	Д	Ё	e	u	E	U
5	CR	\	5	+	j	у	J	У	f	v	F	V
6		ł	6	џ	е	ф	Е	Ф	g	w	G	W
7		i	7	№	ж	х	Ж	Х	h	x	H	X
8	>	?	8	ђ	з	ц	З	Ц	i	y	I	Y
9	<	!	9	ѓ	и	ч	И	Ч	j	z	J	Z
A	[	$	I	^	й	ш	Й	Ш	k	я	K	Я
B	]	љ		Љ	к	щ	К	Щ	l	ъ	L	ъ
C	)	њ	#	Њ	л	ы	Л	Ы	m	ї	M	Ї
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TURKISH (CP 1026)

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1	-	-	-	-		é	/	É	a	j	ö	£	A	J	÷	1
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3	-	-	-	-	ä	ë	Ä	Ë	c	l	t	.	C	L	T	3
4	-	-	-	-	à	è	À	È	d	m	u	@	D	M	U	4
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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OCR-A (CP 892)

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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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2-	FF	'	2	.	-	-	-	-	c	s	C	S
3-	NL	"	3	,	-	-	-	\	d	t	D	T
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INTERNATIONAL SET 5 (CP 500)

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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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OCR-B (CP 893)

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6	-	-	-	-	-	-	-	_	f	o	w	-	F	O	W	6
7	-	-	-	-	å	-	Å	¯	g	p	x	-	G	P	X	7
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DEVICE BUFFER CODING FOR COUNTRY SET SELECTED (DSC MODE)

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